

## **APPENDIX A**

### **INITIAL ASSESSMENT OF LONG TERM STEWARDSHIP SCIENCE AND TECHNOLOGY NEEDS**

# Appendix A

## Contents

I. Initial Assessment Methodology	A-3
A. Initial Assessment of Long-Term Stewardship Science and Technology Needs	A-3
B. Existing DOE Sources of Potential LTS Needs Information	A-6
C. Reports as a Source of Potential LTS Needs	A-7
D. Potential LTS Needs from Interviews with Site Operations Personnel	A-9
E. Methodology for Screening Potential LTS Needs	A-13
F. Discussion of Screening Criteria and Methodology	A-14
II. Results and Analysis	A-19
A. Overview	A-19
B. Site Maintenance Analysis	A-21
C. Final Engineered System Performance Analysis	A-24
D. Data Management Improvement Analysis	A-26
E. Understanding of Fate and Transport Analysis	A-27
F. Long Term Surveillance and Monitoring Analysis	A-29
G. Non-Science and Technology Long-Term Stewardship Analysis	A-30
H. Improve Confidence in the Risk Prediction Analysis	A-31
I. Enhance the Ability to Respond to Failure Analysis	A-33
J. LTS Screening Category Analysis	A-33
III. Analysis of Second Screening by Logical Categories	A-37
A. Analysis of Subsurface Science Needs	A-37
B. Analysis of Surveillance and Monitoring Needs	A-40
C. Analysis of Caps and Covers Needs	A-44
D. Analysis of Information Management Needs	A-45
E. Analysis of Physical Barriers Needs	A-47
F. Analysis of Ecosystem Monitoring Needs	A-49
G. Analysis of Toxicity Needs	A-49
H. Analysis of Non-Science and Technology Needs	A-50
I. Screening Results for Contaminated Site Type (Media)	A-50
IV. Findings	A-52
Glossary of Appendix A -- (Interview Questions, Screening Criteria, and Definitions)	A-56
Attachment A -- Matrix Template	A-65
Attachment B -- List of All LTS Needs	A-67
Attachment C -- Subsurface Science Needs	A-90
Attachment D -- Surveillance and Monitoring Needs	A-101
Attachment E -- Caps and Covers Needs	A-113
Attachment F -- Information Management Needs	A-116
Attachment G -- Physical Barriers Needs	A-119
Attachment H -- Ecosystem Monitoring Needs	A-122
Attachment I -- Toxicity Needs	A-124
Attachment J -- Non Science and Technology Needs	A-126
Attachment K -- Complete Set of Screened LTS Needs	A-129

# **APPENDIX A INITIAL ASSESSMENT OF LONG TERM STEWARDSHIP SCIENCE AND TECHNOLOGY NEEDS**

## **I. Initial Assessment Methodology**

### **A. Initial Assessment of Long-Term Stewardship Science and Technology Needs**

The process of identifying long-term stewardship (LTS) science and technology (S&T) needs involved (a) determining what sources of potential needs were available (e.g., reports, interviews); (b) developing a methodology, screening criteria, and an electronic database for use as tools to help identify or evaluate those sources; (c) collecting the potential needs from those sources; (d) using the screening methodology to narrow all potential needs to only those that met our criteria for LTS S&T needs; (e) using information entered into the screening database for categorizing and sorting the needs that met the criteria; and (f) evaluating the sorted and categorized needs and summarizing them into this initial needs assessment, which will be used as the basis for the Phase II needs assessment process. Figure 1 is a graphic depiction of the screening methodology, and Figure 2 shows the process flow for developing this long-term stewardship needs assessment. The ultimate objective of this effort is to use the needs assessment information to prepare a “roadmap” as part of the EM R&D investment strategy to improve the reliability and effectiveness of future long term stewardship activities.

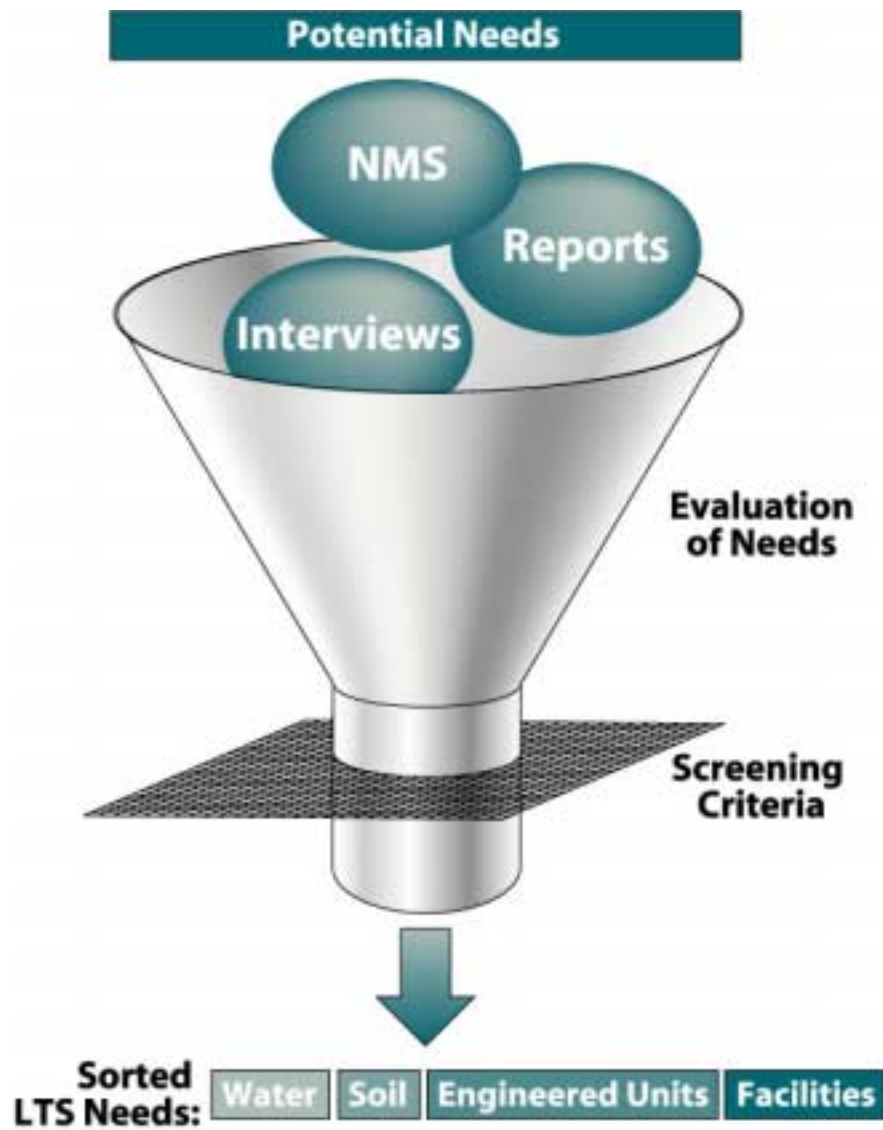
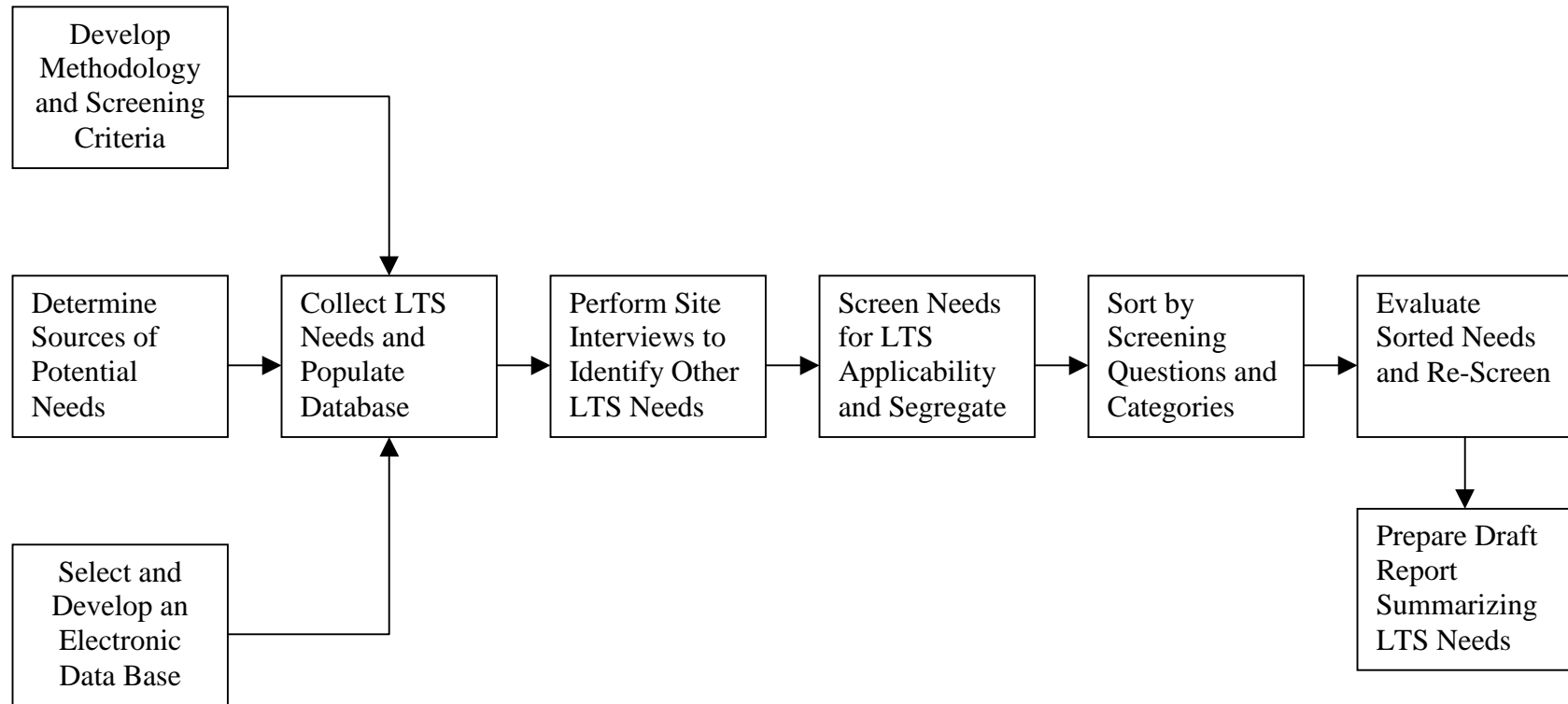


Figure 1. Screening Process



**Figure 2. Long Term Stewardship Needs Assessment Process Flowchart**

## **B. Existing DOE Sources of Potential LTS Needs Information**

Numerous processes and documents have been employed within DOE to identify, prioritize, and track needs for research or technology to solve critical EM problems. These processes and documents have used DOE site operations, environmental restoration and waste management, and research personnel, along with regulators and stakeholders in some cases, to define where needs exist for technology development. The needs identified by these groups are found in documents and databases such as:

- EM Needs Management System (NMS),
- Individual Site Technology Coordination Group (STCG) databases,
- Environmental Management Science Program (EMSP) Management Plan,
- Integrated Planning, Accountability, and Budgeting System (IPABS),
- EM R&D Multi-year Program Plan (MYPP),
- EM Disposition Maps,
- Focus Area MYPPs,
- Focus Area Program Management Plans,
- Other EM Program Management Plans,
- DOE's Environmental Quality R&D Portfolio,
- Environmental Management Advisory Board (EMAB) reports, and
- The Characterization, Monitoring, and Sensor Technology (CMST) portfolio.

The needs data are used by EM-50 Focus Area personnel and others in prioritizing and funding specific projects.

A review of these sources led to the conclusion that the best single source for evaluating existing S&T needs specific to DOE sites for this initial assessment is the EM

Needs Management System. The NMS is a database (now part of the Technology Management System that can be accessed on the Internet at <<http://tms.em.doe.gov>>) maintained at DOE Headquarters. This database is a summary of needs and their descriptions prepared by the individual facilities' Site Technology Coordination Groups. Individual site or field office STCG databases contain more detail than is found in the NMS, and those STCG Internet web pages were reviewed when the information in the Headquarters-level NMS database was too brief and not sufficient for purposes of this analysis. While the NMS is a good, comprehensive tool that lists currently identified S&T needs (there are 810 needs in the FY 2000 database), it has limitations regarding long-term stewardship applications. The NMS was not originally designed or intended to identify long-term stewardship needs. The individual "problem holders" and STCG personnel, who developed the needs in the NMS, did not develop them with LTS as the focus; therefore, they were more focused on identifying nearer-term needs related to environmental restoration or waste management activities for assessment and funding prioritization. Nevertheless, the NMS is still a good source of S&T needs and was a major source of needs information which was screened and evaluated.

### **C. Reports as a Source of Potential LTS Needs**

Another good source of information for S&T needs is published or draft reports. The EM-51 LTS Internet web site (<http://lts.apps.em.doe.gov>) has a list of reference material related to long-term stewardship issues. Many of these reports are related to management or policy issues, but they were also reviewed to identify potential LTS S&T needs. Reports prepared by groups that have evaluated DOE research programs, such as the National Research Council of the National Academy of Sciences or the Keystone Center, were also

reviewed. While a number of these publications identify areas in which DOE research efforts may be insufficient, none of the reports was specifically meant to identify research needs with long-term stewardship applications. However, S&T needs with potential stewardship implications were identified from these reports as part of the screening and evaluation process.

The draft *NDAA Report to Congress on Long-Term Stewardship at DOE Sites* describes planned stewardship activities at DOE facilities. The report is organized with one chapter per state, and a few of these chapters provide a summary level discussion of needs for technology development that could improve reliability or reduce costs of planned stewardship. This report was also used as a source.

The reports which contained needs that were identified as long-term stewardship through our screening process include:

1. *Managing Data for Long-Term Stewardship*, Working Draft Report, ICF Kaiser Consulting Group, March 1998.
2. *Research Needs in Subsurface Science*, National Research Council of the National Academies of Science, March 2000.
3. *DOE Complex-Wide Vadose Zone Science and Technology Roadmap: Characterization, Modeling, and Simulation of Subsurface Contaminant Fate and Transport, Vadose Zone Science Integration and Technical Basis (Draft)*, INEEL/EXT-2000-00112, May 2000.
4. *National Defense Authorization Act (NDAA) Long-Term Stewardship Report (Draft)*, DOE, June 2000.



5. *Environmental Management Science Program, Sensors Initiative for Identification of Long-Term Stewardship Research Needs (Working Draft)*, Workshop Held in Idaho Falls, ID, June 19& 20, 2000.

#### **D. Potential LTS Needs from Interviews with Site Operations Personnel**

The third category of source information for potential LTS S&T needs (in addition to the NMS and reports) was interview information from DOE site personnel. Interviews were conducted to obtain input from operational organizations that will be responsible for carrying out stewardship activities. Original plans included interviews at INEEL (a large continuing mission site), the Grand Junction Project Office (which has responsibility for long term surveillance and maintenance at a number of sites around the country), Weldon Spring (where most of the remediation has been completed), and other sites that are scheduled to begin stewardship in 2006 (Fernald Environmental Management Project, Rocky Flats Environmental Technology Site, and Sandia National Laboratories). However, schedule and resource considerations limited the number of sites that could be visited, and the actual visits were narrowed to INEEL, GJPO, and Weldon Spring. Although no onsite interview was conducted at Fernald, information regarding current NMS needs and future stewardship-related needs was also obtained from that site by telephone and other communications. A memorandum resulting from the Fernald discussions was used as a source of needs. One other internal memorandum that summarized a discussion between INEEL and EM-51 personnel was also a source document. Science and Technology needs resulting from these interviews were screened, using the same criteria as the NMS needs and those needs identified from reports, to determine which ones had long-term stewardship implications.

Prior to conducting interviews, a set of assumptions and questions to be used during the interviews was prepared. The purpose of the questions was to set the framework for the discussion and to try to get participants to think “long term” rather than about relatively short-term milestones that normally drive project activities. The key assumptions were that cleanup or stabilization had been completed, the end state was achieved, and the interviewee(s) was now responsible for long-term stewardship. The questions were intended to identify information such as

- What hazards or contamination would remain?
- What would need to be monitored or maintained to continue to ensure that human health and the environment were being protected?
- What are the significant regulatory, risk, and cost elements of anticipated stewardship activities?
- How could advances in S&T improve the reliability or reduce the costs of stewardship?

The set of draft questions was reviewed by several people representing a variety of expertise and backgrounds (e.g., ER, field operations, risk assessment) prior to conducting the initial interviews. The questions were revised, based on comments received and on the experience of the first few interviews for which they were used. The final set of assumptions and questions used for most of the interviews is found in the Glossary of Appendix A.

Since the INEEL is a large, complex site with a variety of facilities, programs, and environmental legacy problems, needs identified at the INEEL should be representative of those for many sites in the DOE complex. Twelve separate interviews were conducted with operations-oriented groups at the INEEL during a three-week period. The total number of 29

personnel were interviewed from these groups that included those responsible for operations at several diverse Environmental Restoration projects. These were:

- Waste Area Group (WAG) 1 at Test Area North where there are closed underground tanks and wells, and groundwater plumes with organic and radionuclide contamination;
- WAG 3 at the Idaho Nuclear Technology and Engineering Center, a facility that previously processed nuclear fuel and has soil and groundwater contamination (chemicals and radionuclide) areas that are being remediated,
- WAG 7 at the Radioactive Waste Management Complex where there is buried transuranic and low level waste in pits and trenches, and
- WAG 10 that is responsible for sitewide soil and groundwater remediation and monitoring activities not covered by other WAGs.

In addition to these environmental restoration projects, representatives of the following groups or programs were also interviewed:

- High Level Waste Program
- Spent Nuclear Fuel programs (both INEEL and National SNF program)
- Transuranic and Low Level Waste programs
- Deactivation, Decontamination and Decommissioning
- A proposed Facility Entombment Demonstration program
- Mixed Waste Focus Area
- Nuclear Materials Focus Area
- INEEL Tank Closure/Voluntary Consent Order program.

The purpose of interviewing such a broad spectrum of operations oriented groups was to try to capture needs of “end user” or “problem holder” organizations, rather than just the views of those with research interests. A representative of the Grand Junction Project Office assisted in about half of the interviews at the INEEL. The INEEL STCG also participated in each of the INEEL interviews because of the STCG role in working with end users to define and track potential needs.

The second site interview was conducted with the Grand Junction Project Office. Their responsibility is for long term surveillance and maintenance at a number of remediated sites around the country (many of them engineered disposal cells containing uranium mill tailings) and other sites that are currently in various stages of cleanup (e.g., facilities currently in the Formerly Utilized Sites Remedial Action Program) that will also be transferred to GJPO for stewardship. GJPO personnel have a current, operational perspective of long-term stewardship activities and future needs that added great value to the needs assessment process.

The third site interview was conducted at the Weldon Spring Site Remedial Action Project near St. Louis, Missouri. This site was selected because it is a site where most of the remediation has been completed, a large engineered disposal cell is approaching completion, and plans for long-term stewardship are being prepared. The cap over the disposal cell will be completed in 2002, and responsibility for long-term stewardship (surveillance, maintenance and monitoring) will be transferred to GJPO in FY 2003. Because they are moving rapidly toward stewardship activities, DOE and contractor personnel at WSSRAP were also able to provide an operational perspective regarding long-term stewardship needs. In addition to INEEL personnel, a GJPO representative also participated in this site visit to

better understand the current project status and stewardship plans. Anticipated stewardship activities at many sites will involve monitoring of subsurface contamination, and many currently identified needs are related to subsurface contamination. Thus, the Subsurface Contamination Focus Area (SCFA) has a continuing interest in needs identified for LTS and provided a representative for this interview as well. EM-51 participation in the site visit was provided by a representative from an EM-51 support contractor who has been involved in preparation of the LTS reports, including the NDAA Report and the Long-Term Stewardship Study for PEIS Settlement Agreement.

## **E. Methodology for Screening Potential LTS Needs**

Some sites, STCGs and/or Focus Areas have reviewed the needs contained in the NMS to determine which ones were related to long-term stewardship, and therefore, a word search of the NMS database yields a set of needs that are labeled as “long-term stewardship.” Unfortunately, the approach to this labeling exercise was not the same from site-to-site. To provide some consistency, the INEEL team developed a set of screening questions or criteria to be used to review each of the 810 needs in NMS. This process, using one set of questions and the same set of reviewers, resulted in a more consistent identification of LTS S&T needs from the existing NMS set. Once developed, the same set of criteria was used to screen and categorize potential LTS needs found in reports or obtained during site interviews.

The first step in this process was to develop a set of questions about a potential need to determine a relationship to long-term stewardship (i.e., if it is a need related to an activity required to protect human health and the environment from hazards remaining after cleanup is complete). As with the interview questions discussed earlier, the initial draft screening questions were developed and reviewed by the INEEL LTS S&T team, refined, and then sent

to others outside of the team for review and comment. These key questions and comments were then incorporated into an initial set of screening criteria. The screening criteria were entered into an Access database so that a uniform, documented process of evaluating needs and tracking results was used.

As a “field test” of the process and criteria, the 137 needs in the INEEL STCG database were screened. A meeting was held on June 6, 2000, at INEEL to explain the process, discuss results (i.e., which needs had been labeled as related to long-term stewardship), and solicit comments on the process. End user groups represented at this meeting included environmental restoration (WAGs and technology development personnel), the MWFA, NMFA, HLW program, STCG, and EMSP. Many useful comments and suggestions were received, and the screening criteria and database were modified accordingly. The final set of screening criteria and clarifying definitions is in the Glossary of Appendix A.

The actual screening was conducted by an interdisciplinary technical working group to foster discussion and reach consensus as the screening criteria were applied to each potential need. The results (positively answered questions) were captured in the database to allow further sorting, evaluation, and display. (See the screening matrix in Attachment A of this appendix.)

## **F. Discussion of Screening Criteria and Methodology**

The first screening question is really a “go/no-go” criterion to determine if the need was related to post cleanup (an LTS activity). For the purposes of this initial need assessment screening exercise, the decision was made to identify only S&T needs that are related to post-cleanup activities. So, the first question is: “Is it or does it ensure or

demonstrate protection of human health or the environment after cleanup, disposal, or stabilization is completed?”

There are many legitimate S&T needs that have long-term implications, or needs that if addressed, would have long-lasting impacts. Needs related to making waste forms more robust are examples of needs with long lasting impacts yet were not included. For the purposes of this assessment, if the need is primarily critical to the cleanup mission (e.g., related to characterization or treatment), then it was not considered an LTS S&T need. Also excluded from this initial needs assessment were LTS needs associated with waste repositories, such as the Waste Isolation Pilot Plant for transuranic waste and Yucca Mountain for spent nuclear fuel. These facilities will have a set of needs specifically related to their operations and locations. A comment “box” was added to the database to identify those needs determined not to meet the first criterion but that nevertheless had LTS implications.

Some science needs are related to better understanding of fate and transport of contaminants and have long-term implications, even though the need is primarily focused on improving knowledge necessary to make a better remedy selection. There is a broad suite of subsurface science needs that fit this description. These needs were categorized, as LTS in this initial needs assessment because they represent such an extensive set of comprehensive needs that are applicable to many DOE cleanup decisions and follow-on activities.

If a need passed the first screening question, then a number of other questions (which are not prioritized or weighted for importance at this stage) were asked to help further understand and categorize the needs. For example:

- Is it or does it pertain to site maintenance?

- Does it relate to better understanding of the final engineered system performance?
- Does it contribute to a greater understanding of fate and transport of contaminants?
- Does it improve data management?
- Does it enhance the overall confidence in projected risk estimates?

A number of needs were identified that truly are LTS needs, but were determined not to be primarily science and technology related needs. Examples include: how to ensure funding of stewardship for very long periods, issues of intergenerational equity, possible needs for regulatory changes, etc. A question and category of “non S&T needs” was included to be able to track these needs.

After this set of questions was addressed, each need (except non S&T needs) was further categorized to determine if it was related to:

- Waste Form/Physical Barriers
- Data Collection/Transmission
- Information Management
- Environmental Setting and System Performance, or
- Crosscutting Issues.

Within each of these five categories, additional attributes were identified to assist in analyzing needs. For example, for needs dealing with Information Management, each need was further evaluated for the attributes of Data Analysis, Data Interpretation, Reporting, Accessibility, Retention, Records Management, and Cost of Records Management. Each attribute that applied received a “check” in the database.



Finally, after a need was placed into one or more of the five categories above, it was determined which contaminated site type or media (water, soil, engineered units, or facilities – see definitions in Introduction section) applied to that need. In some cases (e.g., the Information Management needs), a need could be applicable to more than one type of contaminated site.

For each of the 152 needs that were identified as valid needs from the LTS screening process, a “plain language” description was written to provide a non-technical description for easier understanding and clarity since many of the need titles are very technical and written specifically to be read by individuals having expertise in a particular field.

Entering the needs in the database in this manner provided a useful tool for examining the needs in a number of ways. By answering each question, then assigning the needs to different categories, identifying attributes of each need within the categories, and determining to which media the need was applicable, we were able to rigorously examine the results by querying the database and sorting LTS S&T needs in several ways. For example, we could determine how many needs fit into each of the four media or contaminated site types (soil, water, engineered units, facilities), or how many needs are related to surveillance and maintenance. More complex questions can also be asked. For example, how many needs are related to better confidence in risk prediction and involve contaminant modeling. Obviously, the number of multiple-attribute queries that can be done is quite large (although many would be meaningless).

After the original database was populated and queried, it was determined that there were other ways that the LTS S&T needs could be categorized. The set of 152 included needs was re-evaluated (re-screened) by examining both the title (as found in NMS, a report,

or from an interview) and the “plain language” definition and considering the “checked” categories and attributes for each need. From this “manual” evaluation, the needs were determined to naturally cluster into 8 general categories that provided another means of analyzing and segregating the data. These were:

- Subsurface Science
- Surveillance and Monitoring
- Caps and Covers
- Information Management
- Physical Barriers
- Ecosystem Monitoring
- Toxicity
- Non Science and Technology

These categories resulting from the second screening were used for the more detailed analysis and conclusions that are presented in this report.

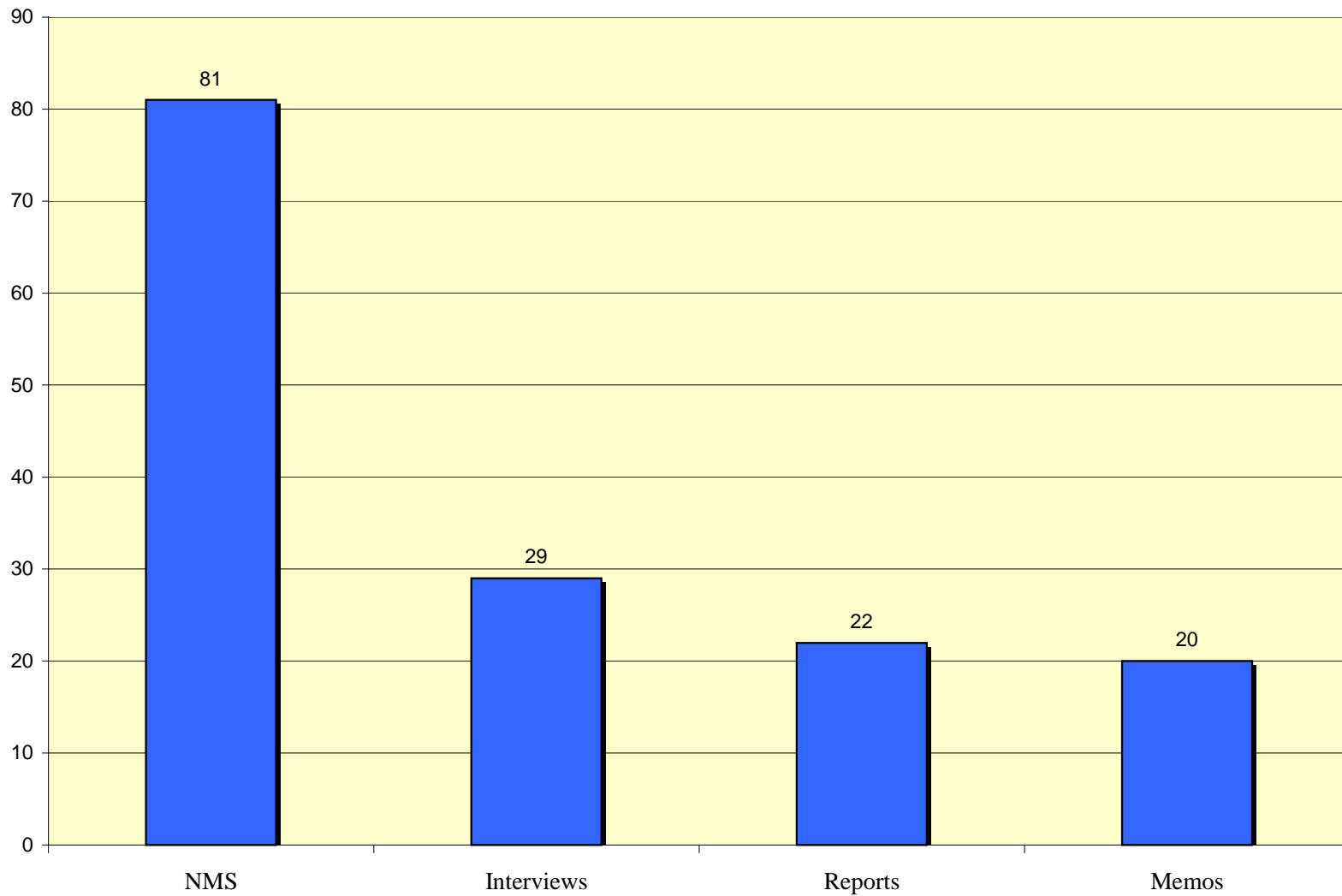
## II. Results and Analysis

### A. Overview

The first step in the needs assessment process is determining what sources contain long term stewardship needs information. As stated in the “Initial Assessment Methodology” section of this Appendix, the primary sources of needs information were the DOE-EM Needs Management System (NMS), published reports, memoranda, and selected site interviews. Of the total 917 potential needs identified from these four sources, 810 were obtained from the NMS and 107 came from reports, interviews, and memoranda. Of the 917 needs that were screened, 152 were labeled as LTS. Eighty-one of those needs were from NMS, 29 were from interviews, 22 were from reports, and 20 were from memoranda (Figure 3). Of the 152 that were determined to have direct long-term stewardship applicability, 13 were classified as “non-S&T.”

Another 130 needs were not included in the LTS needs list because they were more closely related to remediation, treatment, or operations; however, it was determined that satisfying these needs would have “long-term stewardship implications.” An example of this would be: ods-rep-8-tn-1.2, “*Extend the Life of Caps and Covers*,” which is an operational need that would enhance long-term system performance. As a result, these 130 needs were segregated and tracked separately in the database for future use.

In summary, upon completion of the initial needs assessment process, 152 needs were labeled as LTS, 130 were not included, but have LTS implications, and 635 needs were excluded from further review and consideration.



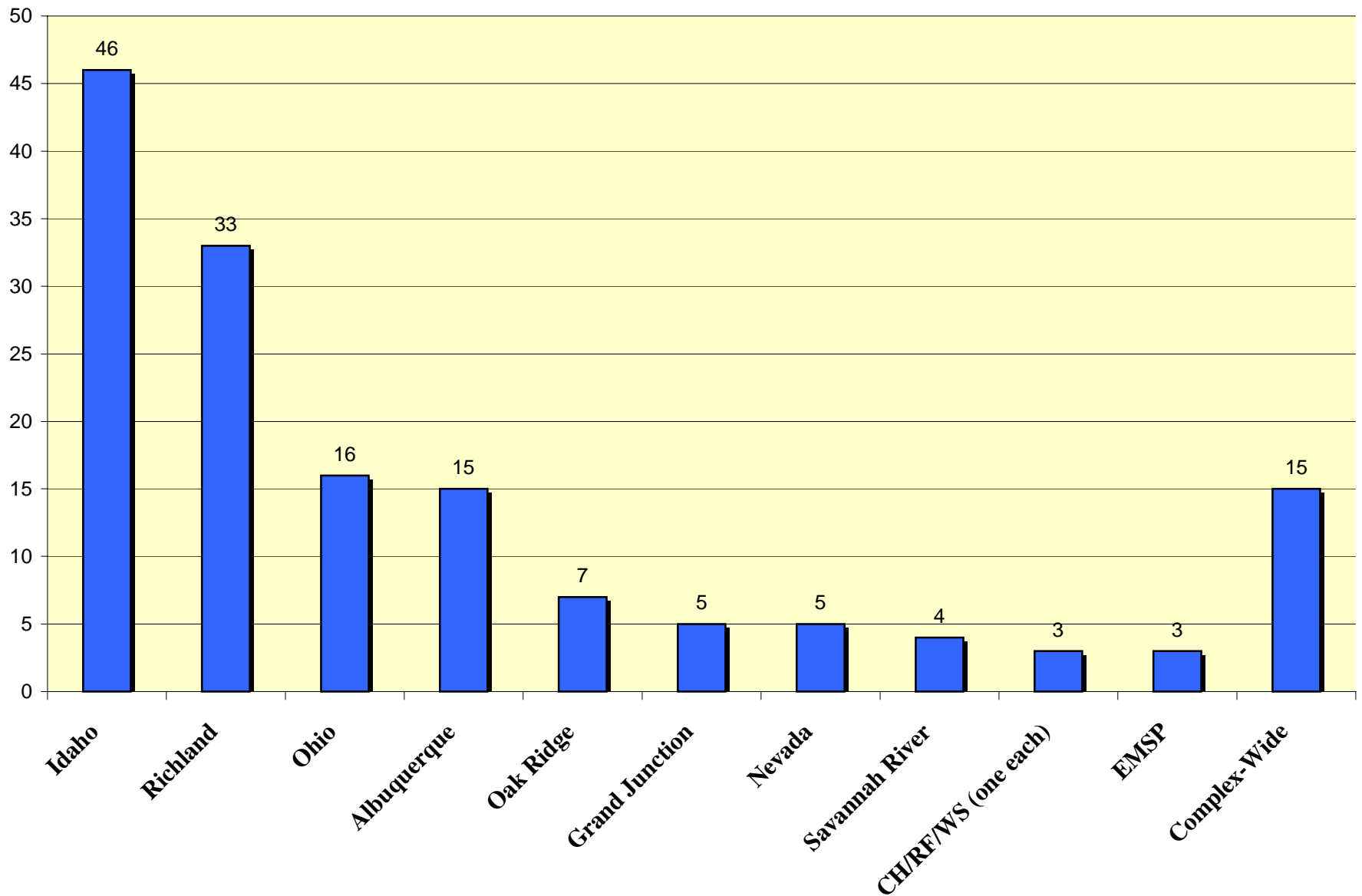
**Figure 3. LTS Needs by Source**

The LTS needs were also segregated by site, resulting in the distribution depicted in Figure 4. The field offices with the majority of included LTS needs were Idaho (46), Richland (33), Ohio (16), and Albuquerque (14), representing more than 70% of the total included needs. It should be noted that the large number of needs associated with Idaho is a reflection of the fact that 12 separate group interviews were conducted at the INEEL. Half of the needs associated with INEEL came from those interviews (labeled in the database as ods-int-id-x-x or Other Data Sources – Interviews –Idaho). Six more resulted from an internal memorandum representing discussion between INEEL and EM-51 personnel (labeled as ods-memo-id-x.x). Similarly, 14 of those from Ohio came from a memorandum resulting from discussions with Fernald personnel (identified as ods-memo-oh-x.x in the database) specifically aimed at identifying potential LTS needs. It should also be noted that many of the needs identified in this manner are not well developed at this time, but represent ideas from interviewed personnel as to what is likely to be needed or would be desirable. More detailed analysis is provided in subsequent sections of this report.

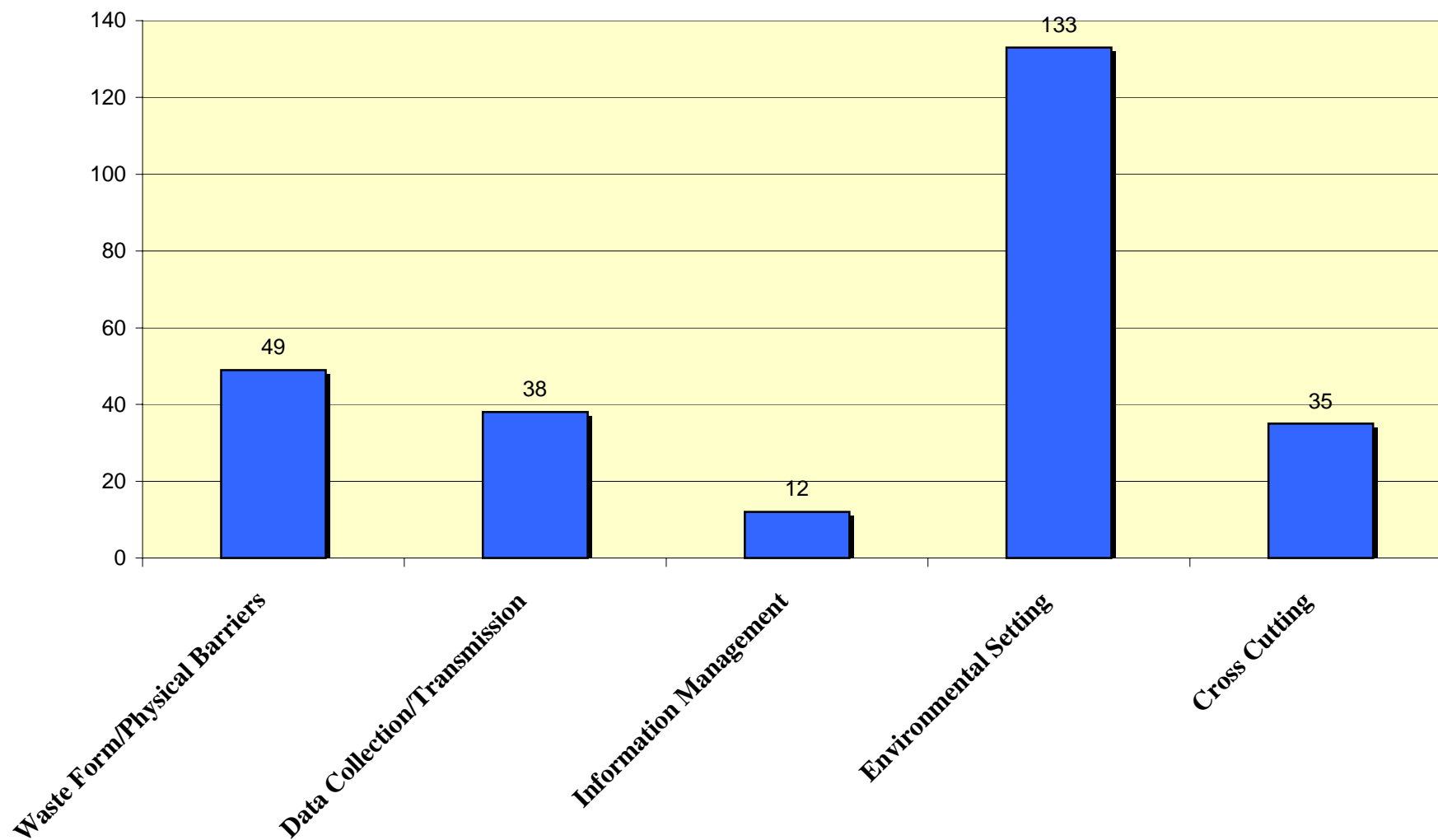
The 152 included LTS needs are also displayed in Figure 5 by the five *screening categories*: Waste Forms/Physical Barriers, Data Collection, Information Management, Environmental Setting, and Cross Cutting needs. The largest number of needs are associated with better understanding of the *environmental setting* (i.e., modeling, model validation, fate and transport, toxicity, uncertainty analysis, subsurface issues). Further analysis of the needs according to each of the screening categories is provided in Section II J.

## **B. Site Maintenance Analysis**

The needs assessment process asked a series of eight screening questions. The purpose of these questions was to further refine and understand the identified need.



**Figure 4. LTS Needs by Site**



**Figure 5. LTS Needs by Screening Category**

Question 1 was “Does this need pertain to site maintenance?” In this case site maintenance is defined as those long-term stewardship activities that are strictly routine in nature. That is, they are expected and planned for. These activities include maintenance of both the environmental setting (e.g., noxious weed control) as well as any manmade structures (cap subsidence repair). As a result of this query it was determined that 23 of the 152 LTS needs pertain to site maintenance. Nine of these needs originated from the Ohio Field Office, 5 from the Grand Junction Project Office, 3 from the Idaho Field Office, 2 from the Oak Ridge Field Office, 1 from the Albuquerque Field Office, and 3 needs that were not site-specific. Nine of the needs came from memoranda, eight came from interviews with the remaining 6 found in reports.

A summary look at these 23 needs indicates considerable overlap with the surveillance and monitoring category. This is not unexpected. As an example, need ods-memo-oh-1.7, *Disposal Facility Physical Change Monitoring System*, expresses a need for a technology to measure physical changes and subsidence in disposal facilities. This information is critical to the site maintenance function. Other needs were related to leachate collection systems for buried waste sites and the need for improved physical barriers to deter intrusion.

### **C. Final Engineered System Performance Analysis**

It is clear that a large percentage of the DOE sites that will require long-term stewardship will have some kind of engineered unit as part of their remedial action. Question 2 recognizes this and asks whether the need addresses the long-term performance standards of the engineered unit. These standards can be as simple as a sign whose lettering is designed to last five years to a vitrified waste form that is designed to last 1,000 years.



The results of this query show 48 of the 152 needs related to the final engineered system performance. Of these, 15 were screened from the NMS database, 17 were obtained from interviews, 9 were located in memoranda, and 7 were found in the various reports. The breakdown by field office shows all field offices identifying at least one need that addresses final engineered system performance. The actual breakdown is as follows:

Field/Project Office	Number of needs
Albuquerque	1
Grand Junction	4
Idaho	15
Nevada	2
Ohio	10
Oak Ridge	3
Savannah River	2
Richland	5
Weldon Spring	1
Not site specific	5

A summary level look at these 48 needs shows a wide spectrum of needs. For instance there are needs related to modeling such as SR00-1030, *Model Degradation in Cement Based Wasteform*, which talks about the need to develop a model to simulate the degradation of saltstone, a cement-based wasteform, and the concrete vaults into which it is emplaced. Other needs pertain to sensors to monitor integrity of the engineered units such as need, ods-rep-emsp-1.2, *Sensors to Monitor Physical Integrity of Barriers, Structures, and Landfills*, which expresses a need to develop improved sensors to monitor physical integrity

of barriers, structures and landfills. Other needs fall into the category of understanding the performance of these engineered units such as AL-09-01-03-SC, *Succession and Long-Term Performance of Landfill Covers* which seeks to understand the effects of plant succession on the performance of landfill covers.

#### **D. Data Management Improvement Analysis**

Question 3 raises the issue of does the identified need improve data management. For this evaluation, data management refers to the whole suite of activities associated with the long-term stewardship data. It includes not only the collection, but also the analysis, interpretation, presentation and retention of the data. This question resulted in the identification of 11 needs. Most of the field offices identified at least one need. The actual breakdown by field office shows Idaho with 4 needs, Ohio and Albuquerque with 2 needs each, and Savannah River, Chicago, and Richland each having 1 need. One of the needs was not site specific. Five of these needs were identified during the screening of the NMS database; two were obtained through the interview process, three were found in memoranda, and one was described in a report.

A big-picture look at these needs shows they fall into a few similar categories and express a concern over aspects of long term viability of the data where viability includes not only the retention but also the collection, availability, retrievability, and ease of access. For example one need, ods-memo-id-1.6, *Tools for the Management of Information for Future Generations*, specifies a need to develop tools to ensure information management and transfer to future generations. One need AL-09-02-02-SC, *Environmental Restoration Site Hazard Information System*, expressed a need for the information system to be able to provide site hazard information in real time for future site activities including emergency

response. Other needs such as ods-memo-oh-1.11, *Integrated Real Time Sensor and Data Transmission System*, describes a need to develop an integrated system to collect, store, and transmit data in real time.

## **E. Understanding of Fate and Transport Analysis**

Question 4 relates to a better understanding of fate and transport and refers to those processes and associated models that affect the movement, behavior and condition of contaminants and include physical, biological, chemical, and nuclear transformations. Transformations include volatilization, biodegradation, oxidation and radioactive decay. This inquiry identified 64 of 152 needs related to the fate and transport matters. This is a large percentage and correlates directly with the general lack of understanding of the contaminant behavior in the subsurface. The field office breakdown includes most of the sites evaluated with the details as follows:

Field Office	Number of needs
Albuquerque	8
Idaho	15
Nevada	3
Oak Ridge	1
Ohio	1
Richland	27

Seven of the needs were not site specific. The vast majority (53 of 64) of these needs were identified by review of the NMS database. Two needs were obtained during the interviews; seven needs were found in reports and two needs were located in memoranda.

For the most part many of these subsurface needs were descriptions of site-specific information gaps and covered a wide range of topics. In some sense collectively they resembled a list of everything one would like to know about the subsurface at a particular site. For example, Need ID AL-09-01-06-SC-S, *Issue of Scale in Flow Prediction and Contaminant Remediation in Porous Media* identified the specific matter “scaling” in flow prediction and contaminant transport. Another example, Need ID RL-SS25S-S, *Detection/Distribution of Contaminants – Chemical Form and Mobility of Dense, Non-Aqueous Phase Liquids in Hanford Subsurface* identified several key science needs for understanding non-aqueous phase form and mobility, etc.

Other needs were more all encompassing and addressed several components of a complex situation such as AL-09-01-01-SC, *Transport of HE and Metals in Fractured Rock and Surface Alluvial Systems*, which raised issues about the delineation and understanding of transport pathways in heterogeneous fractured media; identification of recharge sources; dynamics of contaminant transport in surface alluvial systems; connectivity between individual sites and contaminated waters in the alluvial system and groundwater; and the effects of contaminants on ecological receptors. This complicates any numerical interpretation of the analysis in that an individual NMS need can represent more than one LTS S&T need.

In general, about 30 of the needs expressed a need to know about the physics of fate and transport of contaminants in the vadose zone and alluvial systems. About 15 of the needs expressed a need for development and improvement of models to describe and predict the contaminant fate and transport. Eight of the needs addressed the need for sensors and instrumentation. Five of these needs asked for better contaminant detection, four of the

needs asked for better measurement of physical properties such as moisture content and pressure; two of the needs asked for better measurements of biological activity, and one need identified in situ field measurements as a long-term need. The remaining needs expressed a variety of matters including microbial alterations and connectivity between surface waters and groundwater.

## **F. Long Term Surveillance and Monitoring Analysis**

The needs screening process, utilizing the eight questions contained in the Screening Matrix (Attachment A), resulted in the identification of 76 needs pertaining to long-term surveillance and monitoring (LTS&M). It is no surprise that the LTS&M screening subcategory contains the second largest number of associated needs (second only to risk prediction), since the primary objective of Long Term Stewardship is to protect human health and environment from hazards. Improved long term surveillance and monitoring systems are required to more effectively collect, measure, analyze, verify, and validate this objective.

In addition, there is a direct correlation and application of LTS&M to the need for “greater knowledge and better understanding of subsurface science,” since improved subsurface sensors and monitors will enable researchers to better define the fate and transport of contaminants through the vadose zone. An example of such a need is ID-S.1.04, “*Real Time Field Instrumentation for Characterization and Monitoring Soils and Groundwater*,” which identifies a need for faster and cheaper detection devices to aid in soil and groundwater characterization, sampling, and monitoring of contaminants in the subsurface.

Surveillance and monitoring also applies to the need for a greater understanding of the subsurface conditions beneath engineered units and facilities. An example is ods-int-id-2.1, “*Better Surveying and Monitoring Devices*,” which describes a need for

improved contaminant monitoring below a facility left in place and a method to detect possible subsidence of capped engineered units.

Surveillance and Monitoring needs were identified from across the entire DOE complex. The distribution of needs is as follows:

AL	4	Ohio	12
CH	1	ORNL	6
Grand Junction	4	Richland	8
Idaho	25	Savannah River	2
Nevada	4	Weldon Spring	1

Nine needs were identified as “non-site specific” or complex-wide.

Of the 76 needs, 31 were derived from the NMS, 21 from site interviews, 13 from published reports, and 11 from memoranda.

The future challenge for surveillance and monitoring, based on the needs identified, will be in our ability to develop S&M systems that will perform accurately, reliably, remotely, continuously, in-situ, and for long periods in hostile environments.

## **G. Non-Science and Technology Long-Term Stewardship Analysis**

During the identification of needs phase of the assessment process, it became clear that the sources of information contained other key long-term stewardship needs that did not fall within our definition of science and technology. Since these needs would be critical to the success of any stewardship program, it was decided that it would be appropriate to capture these needs separately. This effort will facilitate future consideration of these needs by other aspects of the long-term stewardship program.

The screening process identified 13 different non-S&T long-term stewardship needs. Two of these needs were found in the NMS database, eight were gleaned from reports and memos, and three were identified through the interview process. Although there were field office designations for a few of these needs, the essence of all thirteen of the needs applies across the complex.

These thirteen needs dealt with seven distinct subcategories. Five of the needs pertained to proper management of research. For example, need ods-rep-3.7, *Integration of the Research Community to Broaden Community of Researchers*, stresses the need to integrate research from government agencies with the research capabilities of the national laboratories, universities, and industry. Two of the needs pertained to security and access control. Two other needs addressed retention of scientific expertise. The last four needs specified life cycle cost estimating, stakeholder participation, land use impacts, and configuration management as being key matters for the Long-Term Stewardship Program.

## **H. Improve Confidence in the Risk Prediction Analysis**

Question 7 asks whether the need improves confidence in the risk prediction. Probably the overarching need of the long-term stewardship program is a need to better understand the impacts (the risk) of the contaminated site. This improved understanding can take the form of reducing the uncertainty of what is understood. This understanding will help to ensure that the long-term stewardship actions are both necessary and sufficient. Answers to this question resulted in 97 of the needs, which if satisfied, would result in improved confidence in the risk predictions. Every site in this assessment had a need associated with this question. The detailed breakdown is as follows:

Field/Project Office	Number of Needs Identified
Albuquerque	10
Chicago	1
Idaho	26
Nevada	3
Grand Junction	3
Ohio	5
Oak Ridge	5
Richland	32
Savannah River	3
Weldon Spring	1

Eight needs were not specific to a particular site. The breakdown by data source shows 70 needs were obtained from a review of the NMS database; 13 were gathered during the interviews; 5 were found in memoranda, and 9 of the needs were gleaned from reports.

A large percentage of the 97 needs, not surprisingly, were in the subsurface science area — an area of large uncertainty with potentially major impacts to any risk prediction. A better understanding of the fate and transport of contaminants will lead directly to a better understanding of the risk. Likewise a better understanding of waste form performance will lead directly to greater confidence in the risk projections. Equally obvious are those needs associated with toxicity which will have a direct link to any risk impact. The last major category will be those needs related to better sensing devices that are more reliable, accurate, and durable. These better measurements will allow for the development of better validation models and increased confidence in the risk estimates.



## **I. Enhance the Ability to Respond to Failure Analysis**

Question 8 wants to know if the resolution of the need will enhance the ability to respond to failure. One of the components of a good stewardship program is the ability to respond in a timely and appropriate manner to any failure, and to be able to determine in advance when a failure occurs. The assessment identified twelve needs that answered Question 8 positively. Of these twelve needs, six were from the Ohio Field Office, two were from the Idaho Field Office, and one need each from the Albuquerque, Oak Ridge and Richland Field Offices. One need did not pertain to any particular site. By data sources, two of the needs arose from the NMS database, two needs were gleaned from reports, two needs were obtained from the reports and the remaining six needs were identified in memoranda.

An overview evaluation of these twelve needs centers on the early detection of system failure. For instance, ods- memo-oh-1.13, *Real-time Leachate Detection and Measurement System*, describes the need for a real time monitoring and sensing system to determine the integrity of leachate collection systems and detect leaks in collection system lines. One need, AL-09-02-02-SC, *Environmental Restoration Site Hazard Information System*, highlights the need to ensure the availability and retrievability of site hazard information in real time for future site activities including emergency response.

## **J. LTS Screening Category Analysis**

The 152 included LTS needs are further cross-cut and segmented into five distinct screening categories to provide yet another perspective: (1) Waste Form/Physical Barriers; (2) Data Collection/Transmission; (3) Information Management; (4) Environmental Setting; and (5) Cross Cutting. The relationship between the screening categories and the site types

(i.e., soil, water, facilities, engineered units) is depicted in the Needs Screening Matrix (Attachment A of this Appendix).

The table below quantifies the results of the LTS needs using the screening categories sort. The total number of associated needs do not equate to the 152 total included needs because many of the needs are associated with more than one category. Segregating the needs using these sorting criteria shows a significant number (50%) of the total LTS needs involve the “Environmental Setting,” validating the complex-wide need for a greater understanding of subsurface science. Descriptions of the five screening categories are provided below, including the individual attributes that further describe the needs sorting subcategories.

<b>Screening Category</b>	<b>Associated Needs</b>	<b>Percent of Total</b>
Waste Forms/Physical Barriers	49	18%
Data Collection/Transmission	38	14%
Information Management	12	5%
Environmental Setting	133	50%
Cross Cutting	35	13%

*Waste Forms/Physical Barriers* – This category includes LTS needs associated with ensuring the durability, maintainability, monitoring, predictability, inspection frequency, and inspection cost of waste forms (such as grout, vitrification, etc.) and physical barriers (such as engineered caps/covers, landfills, etc.). Forty-nine needs are associated with waste forms/physical barriers. The majority of the needs are associated with ensuring or validating the integrity and performance of waste forms or physical barriers. Examples of these include

needs associated with improved monitoring techniques (AL-00-01-04-SC, “*Long-Term Monitoring Strategies and Techniques to Evaluate the Design of Material Disposal Area Engineered Covers*”), and methods to monitor and detect barrier failure, or improved intrusion protection systems (ods-int-gjpo, “*Ways to Strengthen Physical or Institutional Controls*”).

*Data Collection/Transmission* – This category includes LTS needs associated with improving the collection and transmittal data, including field sensors and devices, their durability, maintainability, calibration, inspection frequency, and the cost of inspection. Thirty-eight needs were identified in the data collection/transmission screening category. Typical examples include the need associated with the development of in-situ monitoring devices that can analyze and transmit remotely with little or no human intervention (ods-int-id-3.1, “*In-Situ Samplers to Detect Contaminant Movement*”), and more generic needs associated with the design and development of meteorological data transmission stations (ods-meme-oh-1, *Automated Meteorological Monitoring Stations*).

*Information Management* – This category includes LTS needs associated with improving data analysis and interpretation, reporting, accessibility, retention, records management, and the cost of records management. There are 12 needs associated with the information management screening category. A typical example includes the need associated with the cost effective storage, retention, retrieval, and protection of information (ods-memo-oh-1.1, “*Long Term Record Keeping and Retrievability*”).

*Environmental Setting* – This category includes LTS needs associated with gaining greater knowledge and understanding of the environmental setting (geological and hydrological environment where contaminants reside) related to contaminant modeling, fate and transport,

toxicity, ecological indicators, uncertainty analysis, subsurface issues, model validation, and system performance validation activities. There are 133 needs associated with the environmental setting screening category, the majority of which are related to gaining a better understanding of subsurface science and how contaminants interact with and move through the vadose zone (ods-rep-4.2, “*Full Capabilities of Vadose Zone Characterization, Prediction, and Monitoring*”). Other needs focus on improving our ability to monitor for leaks, groundwater conditions, and physical changes in the subsurface (ods-int-id-6.2, “*Reliable Monitoring Network for Groundwater*”).

*Cross Cutting* – This category includes LTS needs associated with advancing state-of-the-art, long term monitoring capabilities and risk determination methods that cross-cut all screening categories. There are 35 needs associated with the cross cutting screening category. An example of a cross cutting need is long term monitoring and surveillance systems, with remote data collection and transmission attributes (AL-09-02-01-SC, “*Long-Term Site Monitoring System*”).

### **III. Analysis of Second Screening by Logical Categories**

After reviewing the results discussed above, it was determined that “manually” sorting the set of LTS needs into other logical categories would be useful. The set of 152 needs was re-classified by evaluating the need title, plain language description, and other characteristics and attributes from the data presented above. From this exercise, the needs were found to fall into the following general categories:

- Subsurface Science
- Surveillance and Monitoring
- Caps and Covers
- Information Management
- Physical Barriers
- Ecosystem Monitoring
- Toxicity
- Non-Science and Technology

The needs that were placed into these eight logical categories were then analyzed, and the results of those analyses are presented below.

#### **A. Analysis of Subsurface Science Needs**

To no surprise, many (57) of the 152 needs pertain to subsurface science. This category includes not only the need for a basic understanding of the physical, chemical, biological, and nuclear processes associated with the fate and transport of contaminants in the subsurface, but also the need for the physical and computational modeling to predict concentrations of a contaminants throughout time in the various media, such as the

groundwater, vadose zone, and surface water. This area also includes the need for the validation of existing models and the need to reduce the uncertainty of the modeling results.

A few words about the inclusion of the subsurface needs in the LTS S&T needs are warranted. Until the fate and transport of contaminants at the site in question are understood and the long-term impacts of these contaminants on the environment and human health can be predicted, appropriate cleanup decisions can not be made. However, for the purposes of this needs assessment, the needs were included in the long term stewardship analysis since a lot of clean up decisions have been made and will be made with incomplete information and knowledge. Resolution of these matters can lead to greater confidence in the planned and existing stewardship activities and ultimately to the identification of cost saving measures.

Of the 57 needs identified that were related to subsurface science, 51 were obtained from the Needs Management System, 5 from reports, and 1 from an INEEL internal memo. These 57 needs are associated with the various field offices as follows: 28 from Richland; 12 from Idaho; 8 from Albuquerque; 2 from Oak Ridge; and 1 from Savannah River. Six of the needs were not site specific and apply generically. Due to the nature of the vadose zone, all 57 of these needs were placed in both the contaminated soil and the contaminated water site categories.

For the most part, many of these subsurface needs were descriptions of site specific information gaps and covered a wide range of topics. In some sense, collectively they resembled a list of everything one would like to know about the subsurface at a particular site. For example, Need ID AL-09-01-06-SC-S, *Issue of Scale in Flow Prediction and Contaminant Remediation in Porous Media*, identified the specific matter “scaling” in flow prediction and contaminant transport. Another example, Need ID RL-SS25S-S,

*Detection/Distribution of Contaminants – Chemical Form and Mobility of Dense, Non-Aqueous Phase Liquids in Hanford Subsurface*, identified several key science needs for understanding non-aqueous phase form and mobility, etc.

Other needs were all encompassing and addressed several components of a complex situation such as AL-09-01-01-SC, *Transport of HE and Metals in Fractured Rock and Surface Alluvial Systems*, which raised issues about the delineation and understanding of transport pathways in heterogeneous fractured media; identification of recharge sources; dynamics of contaminant transport in surface alluvial systems; connectivity between individual sites and contaminated waters in the alluvial system and groundwater; and the effects of contaminants on ecological receptors. This complicates any numerical interpretation of the analysis in that an individual NMS need can represent more than one LTS S&T need.

In general, about 30 of the needs addressed our understanding of the physics of, fate of, and transport of contaminants in the vadose zone and alluvial systems. About 15 of the needs expressed a need for development and improvement of models to describe and predict the contaminant fate and transport. Eight of the needs addressed the need for sensors and instrumentation. Five of these needs asked for better contaminant detection, four of the needs asked for better measurement of physical properties such as moisture content and pressure; two of the needs asked for better measurements of biological activity, and one need identified in situ field measurements as a long-term need. The remaining needs expressed a variety of matters including microbial alterations and connectivity between surface water and groundwater.

This assessment included the review of two major reports that have addressed the complex wide needs relative to the subsurface. These reports were the National Research Council's *Research Needs in Subsurface Science*, and an INEEL Draft Report, *DOE Complex-wide Vadose Zone Science and Technology Roadmap: Characterization, Modeling, and Simulation of Subsurface Contaminant Fate and Transport*. The vast majority of the needs identified in these two documents pertained more to the focus, direction, and management of the research needed rather than specific research needs. The set of Subsurface Science needs is Attachment C of this Appendix.

## **B. Analysis of Surveillance and Monitoring Needs**

The Surveillance and Monitoring needs area contains 65 of the 152 LTS needs, representing 42% of the total needs (Attachment D of this Appendix). These needs are divided into seven distinct subcategories. Each of the subcategory definitions is provided below, along with an example extracted from the needs database. Need's summaries are provided for each subcategory along with the distribution of included needs by DOE Field Office. Twenty-two needs were derived from the NMS, twenty-one from interviews, nine from reports, and thirteen were extracted from memoranda issued by various field offices. Surveillance and Monitoring needs summarized by contaminated site types were distributed as:

- Soil 39
- Water 39
- Facilities 17
- Engineered Units 33



***Instruments, Sensors and other Devices*** – Needs in this category require the development of new instruments or sensors to perform mapping, characterization, monitoring, or surveillance functions directed toward increasing our knowledge and understanding of how contaminants move in the subsurface.

There were 29 needs included in this subcategory. The distribution of these needs by Field Office is as follows:

Albuquerque	2
Chicago	1
Grand Junction	1
Idaho	11
Nevada	2
Oak Ridge	3
Ohio	4
Richland	1

In addition, EMSP identified one need, and three more were included in various complex-wide reports, for a total of twenty-nine. An example of a need included in this category is: CH-SS04-99 – “*Long-Term Groundwater Monitoring*,” a need for enhanced or new monitoring techniques that allow more reliable, quick and inexpensive groundwater analysis.

***Data Collection, Sampling and Analysis*** – Needs in this category require the development of surveillance and monitoring devices to improve our ability to sample, collect, analyze, and transmit soil or water related data.

There were four needs included in this subcategory: two from Idaho and one each from Nevada and Ohio.

An example of a need included in this category is: ods-int-id-3.1 – “*In-Situ Samplers to Detect Contaminant Movement*,” a need for in-situ samplers that can detect and send data remotely, with little or no human intervention.

***Greater Understanding of Subsurface Science*** – Needs in this category require the development of improved sensors and monitors to advance the science and gain a better understanding of how various contaminants reside, interact with, and/or move through multiple below ground configurations.

There were two needs identified in this subcategory, one each from Idaho and Richland. An example of a need included in this category is: RL-SS37-S – “*Monitoring of Contaminants – Chemical Sensor Principles*,” a need to develop a better understanding of the physics and chemistry that will lead to more accurate and more sensitive measurements of contaminant concentrations.

***Ensuring the Integrity and Longevity of Entombed Facilities*** – Needs in this category require the development of in-situ monitors, sensors, or surveillance systems to ensure the integrity and long-term performance of facilities. This includes entombed reactors, canyons, and other buildings whose residual contamination has been left in place.

Eight needs were identified in this subcategory: four from Idaho, three from Ohio, and one from Richland. An example of a need included in this category is: ods-int-id-2.1 – “*Better Surveying and Monitoring Devices*,” a need for improved contaminant monitoring below a facility left in place.

***Ensuring the Integrity and Longevity of Engineered Units*** - Needs in this category require the development of in-situ monitors, sensors, or surveillance systems to ensure the integrity

and long-term performance of engineered units. This includes landfills, caps and covers, and other land-based storage or waste disposal units.

There were a total of eighteen needs identified in this subcategory: six each from Idaho and Ohio, one each from Albuquerque, Grand Junction, Oak Ridge, Savannah River, and Weldon Springs. In addition, EMSP reported one need for a total of eighteen.

An example of a need included in this category is: ods-int-gjpo-1.5 – “*Ways to Measure Moisture Flows in Caps*,” a need to develop a more cost effective, remotely operated device to measure moisture in/under caps and covers.

***Ecosystems*** – Needs in this category require the development of improved sensors, monitors, and surveillance systems to assess the natural environment surrounding engineered units and entombed facilities to minimize the impacts on human health and the environment.

Two needs were included in the *Ecosystems* subcategory. The distribution of these needs was one reported by EMSP and one identified by the Idaho Field Office. An example of a need included in this subcategory is: ods-rep-emsp-1.3 – “*Remote Sensing of Ecosystems*,” a need to develop improved remote sensing of ecosystem indicators including vegetation.

***Physical Barriers*** – Needs identified in this category require the development of surveillance and monitoring devices for the detection and alarm of human intrusion into hazardous facilities, and engineered units.

One need was identified in the *Physical Barriers* subcategory: ods-int-gjpo-1.3 – “*Ways to Strengthen Physical or Institutional Controls*,” a need for improved physical barriers and intrusion prevention systems.

## C. Analysis of Caps and Covers Needs

Six needs were derived from the NMS, four from interviews, one from published reports, and one was extracted from a field office memorandum. These needs were assigned to contaminated site types (media) as follows:

- Soil 1
- Water 0
- Facilities 2
- Engineered Units 12

Needs identified in this subcategory, listed in Attachment E of this appendix, require improved designs that will ensure the long-term performance and integrity of landfills, caps and covers, and other land-based storage or waste disposal units configured with engineered controls.

Twelve needs were identified in this category. The distribution of these needs by Field Office is:

- Albuquerque 2
- GJPO 1
- Idaho 4
- Nevada 2
- Ohio 1
- ORNL 1
- Richland 1

An example of a need included in this subcategory is: NV11-0001-08 – “*Long Term Management of Void Space, Containers, and Cover Subsidence Disposed,*” a need to develop

methods to better predict the dynamics of collapse of void space, container/waste form degradation, and subsidence of cap materials.

#### **D. Analysis of Information Management Needs**

Of the 152 LTS S&T needs, 9 were found to pertain to information and data management improvement and are listed in Attachment F of this appendix. Whether needs involved improved systems for site characterization data, baseline inventories, or long term monitoring and surveillance of contaminants, there appears to be a general need for consistency in application and dependable information management systems where information can be recorded, stored, preserved, and easily accessed over the long term.

For the purposes of this analysis LTS Information Management needs refers to the whole suite of activities associated with the LTS data. It includes not only the LTS activity needs and related data collection, but also the analysis, interpretation, presentation, and retention of the data. Another way of describing LTS information management needs included under this category are those LTS needs required to develop the ability to store, retrieve, transmit, and ensure the security of historical information.

Four LTS information management needs came from the NMS database. One from Albuquerque (need for a real time information system, including emergency response, to ensure the availability and retrieval of site hazard information) for future site activities. Two were from Richland (a need for a single and consistent inventory of the discharges and disposals of radionuclides and chemicals to the surface and subsurface and to record any discharges to the Columbia River and the other improved information management by supporting better data in models). One other came from Savannah River (a need to develop a relational database to allow storage and retrieval of data including photos and videos).

Two information management needs were identified from the INEEL Site Interviews involving two different interview groups as sources. The Site-wide Monitoring and Surveillance Group indicated a need for a long-term storage and retrieval system dealing with groundwater data and log books since no formal systems for managing them exists. The Spent Nuclear Fuel Program noted a need for an information and records management system to define, record and store information dealing with fuels to be sent to the repository.

Two other information management needs resulted from memoranda that discussed LTS needs. One of these came from Fernald and it described the need to develop a long-term record keeping system that is easily accessed and maintained. Another memorandum summarizing S&T needs unique to LTS that were related to complex-wide concerns noted a need to develop a system to maintain and readily access critical information needed to maintain engineering and institutional controls for long periods of time.

One final need was identified from a report that contains a summary of information needs. During the review of LTS needs which fall within post-cleanup activities related to information and data management, one report (“Managing Data for Long Term Stewardship,” prepared by ICF Kaiser) involved a detailed study of the type of LTS data needs and information management. The report concluded that most types of information needed for stewardship is already being generated for other purposes, but these data are sometimes destroyed or lost once cleanup is completed and it is not being kept in a way which is user friendly to access or search. Among several information related LTS needs identified from this report is the need for LTS data standards and fields, activity sensitive data locators, and Metadata descriptors (that describe electronic content searches). Existing

data locators and descriptors are not stewardship or LTS activity sensitive, nor are they consistent in content of documents or databases.

## **E. Analysis of Physical Barriers Needs**

Waste Forms/Physical Barriers includes “passive stewardship” measures (e.g., custodial controls such as land or resource use restrictions, permanent markers, signs, or restrictions at a site), and more proactive measures to reduce or eliminate the human intrusion into entombed facilities, engineered units (caps, covers, and landfills), waste disposal and other hazardous areas. Attachment G lists the Physical Barrier Needs. As can be seen, there are three subcategories within the Waste Form/Physical Barriers need area. Definitions for each of the subcategories are provided below, along with an example extracted from the needs database. Need’s summaries are provided for each subcategory along with the distribution of included needs by DOE Field Office. Physical Barrier needs summarized by contaminated site types were distributed as:

- Soil 0
- Water 0
- Facilities 8
- Engineered Units 14

Twelve Physical Barrier needs were identified. Six (needs were derived from the NMS, four were obtained from interviews, one came from published reports, and one was extracted from a field office memorandum.

***Ensuring the Physical Integrity of Waste Forms*** – Needs identified in this subcategory require improved designs and systems to ensure the long-term integrity, sustainability, and performance of waste forms, storage containers, engineered units, and physical barriers.

Ten needs were identified in the *Physical Integrity of Waste Forms* subcategory. The distribution of these needs by Field Office is:

- GJPO 2
- Idaho 2
- Ohio 3
- ORNL 1
- Richland 1
- Savannah River 1

An example of a need included in this subcategory is: ods-rep-4.3 – “*Better Analysis and Assessment Stages for Repository Sites*,” a need for an improved repository design that creates no undue future risk.

***Subsurface Science*** – Needs in this subcategory require a greater understanding of waste form behavior within the subsurface environment.

One need was identified in this subcategory: ID-S-1.12 – “*Understanding the Behavior of Waste Forms and Their Near-Field Transport*,” a need to improve conceptual models to more accurately estimate releases from contaminant waste forms.

***Physical Barriers*** – Needs identified in this subcategory require the development of improved designs, methods, and systems to minimize or eliminate human intrusion into entombed facilities, engineered units, and/or waste disposal and other hazardous areas.

Two needs were identified in this subcategory: both were obtained from the Grand Junction Project Office, within the Albuquerque Field Office.

An example of a need in this subcategory is: ods-int-gjpo-1.2 “*Long-Life Signage*,” a need for improved, more durable signs that are more resistant to weather and vandalism.



## **F. Analysis of Ecosystem Monitoring Needs**

From the second screening to place needs in logical categories, there were two needs associated with the environmental setting of the site (see Attachment H). One need was directed toward understanding the potential impacts to the surrounding ecology. This need from the AL field office, AL-09-01-16-Risk-S, *Extrapolation bias and Uncertainty from using Biomarkers and Numerical Models to Predict Real Ecological Effects*, identifies a fundamental need for field data to test model assumptions and to quantify the uncertainty around using biological indicators and numerical modeling results as indices of population and ecosystem changes. The second need to develop remote sensing capability of ecological indicators. This need, ods-rep-emsp-1.3, *Remote Sensing of Ecosystems*, originated from the Environmental Management Science Program Sensors Initiative for Identification of Long Term Stewardship Research Needs. This was a workshop held in Idaho Falls in June of this year with representation from INEEL, ANL-W, ANL-E, Fernald, ORNL, PNNL, Paducah, Portsmouth, SRS, SNL, Nevada, and the Characterization, Monitoring and Sensor Technology Program. Both of these needs have complex-wide applicability and fall into the soil category.

## **G. Analysis of Toxicity Needs**

The LTS S&T search also identified two needs that fit in the toxicity category as listed in Attachment I. In this case toxicity refers to the adverse effects that a contaminant might have on human health and the environment. The first of these needs, from the Idaho office, ID-S.1.16, *Quantifying Uncertainty in Risk Calculations*, expresses a need for determining the health effects from mixtures of contaminants as well as understanding the uncertainty in the toxicity component of the risk calculations. Although identified as a need

in Idaho, this need would apply complex-wide. The second need from the Richland field office, RL-SS39, *Understand and Provide Means to Quantify the Impacts of River Contamination on Receptors*, expresses a need for the development of appropriate toxicological benchmarks for key river species and for understanding the translation of benchmarks to higher level ecological impacts. These needs do not readily fall into any of the contaminated site categories of soil, water, engineered units, or facilities.

## **H. Analysis of Non-Science and Technology Needs**

The screening for non-science and technology needs did not change for the second screening because needs that were classified as non-S&T were not screened or categorized further. Refer to Attachment J and the previous analysis of this topic.

## **I. Screening Results for Contaminated Site Type (Media)**

As needs were being screened using the screening questions and categories, they were also labeled as to which media or contaminated site type each need was applicable. The four media considered were:

- Water (surface and groundwater)
- Soil (which includes soils, sediments, burial grounds or other disposal areas that do not have engineered containment structures)
- Engineered units (permanent, land-based disposal units such as landfills, vaults, and tanks that have engineered containment structures such as caps or covers, liners, and leachate collection systems; also units designed for long-term retrievable storage of nuclear materials)
- Facilities (facilities that will have contamination remaining, including entombed facilities, or facilities that are demolished to grade and capped)

From the original screening of the 152 needs as shown in Attachment K of this appendix, the results by media were:

Water	100
Soil	46
Engineered Units	66
Facilities	18

Many needs were assigned to more than one contaminated site type, therefore, the total is greater than 152.

As was previously mentioned, the entire set of LTS needs was screened a second time and sorted into logical categories. When this second screening was done, the assignment of needs to the contaminated site types was re-done also. This second screening was done after considerable discussion of how the needs were categorized and what the data revealed. The assignment of media type during this second screening yielded somewhat different results. The differences were due to the fact that the review team was more familiar with the entire set of needs, and that the assignment of media type (especially to the large set of subsurface science needs) was done more consistently. Specifically, nearly all of the subsurface related needs were labeled as being applicable to both water and soil during the second screening, and that was not the case in the original screening. The treatment of engineered units and facilities was also more consistent the second time. For these reasons, the results from the second evaluation are more accurate than the first. The revised results are:

Water	98
Soil	98
Engineered Units	59
Facilities	32

Water and soil were the most common media because of the presence of vadose zone and subsurface science issues across the complex. Also, most surveillance and monitoring activities will be conducted in these media at many sites.

Engineered units (59) was the next largest site type. Many sites demonstrated needs for improved surveillance and monitoring of the system performance of engineered landfills and disposal cell caps, covers, physical barriers, leachate collection systems, and other ways to improve design for longevity and cost effectiveness.

Facilities were the lowest (32) site type. Many structures will be decontaminated and demolished, and may have caps or covers placed over remaining material. For other structures, the safest and most cost effective solution may be entombment. There were needs identified for monitoring or surveillance of these facilities as well.

Attachments B through J of this Appendix show how the needs were sorted by logical categories (i.e., subsurface science, caps and covers, surveillance and monitoring, etc.), and each attachment includes a “contaminated site type” column in order to show how the contaminated site type designation is related to each category.

## **IV. Findings**

A methodology was established for identifying science and technology needs that are associated with long-term stewardship. The methodology was useful for screening and categorizing the needs so they could be analyzed or evaluated to identify common themes or potential areas where research should be emphasized. Although some general conclusions can be drawn from the analyses presented in this initial assessment, the information is too preliminary to be used to make substantial conclusions or firm decisions regarding the funding of research or technology development. This is true because of several factors.

One factor is that the main sources of data were existing information about needs (like the NMS and reports), and although good sources of information, they were not developed with long-term stewardship principles in mind.

Some previously unidentified needs were developed from the interviews that were conducted as part of this assessment. Although a significant number of operations-oriented personnel were interviewed, a commonly expressed thought was, “I really haven’t thought much about long-term stewardship.” That is certainly understandable given the short-term deadlines, regulatory milestones, and the annual budget cycle of DOE programs. Other operations or program personnel (correctly) viewed their role only as remediation, stabilization, treatment, demolition, or long-term storage prior to offsite disposition. The responsibility for stewardship would then be passed on to someone else. The concept of long-term stewardship is relatively new within DOE, and the definitions of exactly what constitutes stewardship, when it begins, and who is responsible are not widely understood. Thus, it was difficult in the relatively short time available for interviews (even though the questions and assumptions were provided to interviewees beforehand) to identify well thought out, validated needs related to long-term stewardship. Interviews would be an important means of identifying and developing such needs, but it would require development of additional guidance and more commitment of time than were available in this phase.

Another limitation of the screening process for the initial needs assessment was that the screening questions, categories, and attributes were not assigned weights or importance factors during this phase of the needs assessment. This step would be essential to providing a more credible and defensible set of needs. In addition, the process, questions and categories,

and weighting assignments should have wider input from around the DOE complex than was possible in this initial effort.

Given those limitations, there are some general findings resulting from the data collected. These are:

- There are many needs associated with a better, fundamental understanding of subsurface science, including fate and transport models, flow in fractured media, chemistry and physics associated with radionuclide and metal interaction with soil particles, etc. Some of these basic science needs are related to making better cleanup decisions, but they certainly impact activities beyond stewardship.
- There were a significant number of needs associated with improved or less costly methods for monitoring and surveillance of contaminated soil and water. These include sensor development for specific contaminants in specific media, automated and remotely operated systems, and automated data transmission.
- A moderate number of needs were related to improving the durability, maintainability or surveillance of caps and covers over engineered units or demolished or entombed facilities.
- Numerous needs were identified related to more reliable information/data management systems for storage and retrieval.

This assessment provided a useful methodology for identifying and categorizing S&T LTS needs as well as identifying broad areas where further research or technology development could impact future long-term stewardship activities. This initial needs

assessment, along with the technology baseline inventory, sets the stage for preparation of a “roadmap” that will further define the direction of needed research and development.

Although useful at this stage, further refinement of the process and broader application at other sites will yield a better defined set of needs, from which to make more reliable prioritization and funding decisions.

## **Glossary of Appendix A -- (Interview Questions, Screening Criteria, and Definitions)**



# Long-Term Stewardship Science & Technology Needs Interview Questions/Assumptions

## Objective:

The purpose of conducting the Long-Term Stewardship (LTS) interviews is to stimulate discussion that will lead to the identification of new S&T needs (in addition to those already included elsewhere, e.g., those coordinated by the Site Technology Coordination Group (STCG) or included in the Needs Management System (NMS) database). These will be included in a baseline of needs for determining future Science and Technology requirements related to LTS. LTS activities are those required to ensure the protection of human health and the environment after cleanup, disposal, or stabilization is complete, and may include things like long-term monitoring, inspection, and surveillance, or long-term operation of a remedy such as a pump and treat system.

## Assumptions:

1. Cleanup, disposal, or stabilization has been completed to acceptable standards and the end state is defined (often as a result of negotiation with regulators and stakeholders e.g., RODs or stakeholder-approved future land use plans, etc.). (NOTE: This will usually be the case. However, there may be cases such as interim RODs where the “decision” has not been finalized, and LTS activities may be still be factored into the final decision.)
2. Even though it may not be known at this time what person or group will be responsible for LTS activities in the future (or if there will be a separate LTS organization or program), **assume for this discussion that it will be your responsibility to carry out appropriate LTS actions.** Your responsibility then is to ensure and demonstrate protection of human health and the environment in a given facility/area after cleanup, disposal, or stabilization is complete.
3. Many facilities/areas/engineered units will require monitoring, surveillance, maintenance, or inspection to verify that the “remedy” (e.g., capped waste burial area, entombed nuclear facility, stabilized spent fuel storage) is performing as intended, or that the end state conditions continue to ensure protection of human health and the environment.
4. Current technologies may be costly to implement over a very long period of time, or involve risk to personnel and/or the environment. Therefore, **solutions are being sought, (and funds are available to invest in new solutions) that will reduce technical and scientific uncertainty, improve the reliability, reduce worker risk or environmental impact, or reduce the cost of LTS activities.**
5. LTS may continue for 25, 50, 100 years or even in perpetuity.

**Questions: (examples are provided for illustration only – please think of specific examples applicable to your situation)**

1. What types of hazards or residual contamination will remain after cleanup, disposal or stabilization is complete? (e.g., groundwater contamination, buried waste, immobilized radionuclides in structures, stabilized spent fuel in canisters, etc.).
2. Have or will the quantities of materials/contaminants remaining after cleanup, disposal or stabilization be quantified? (e.g., cubic feet of buried material, number of curies of what radionuclides, amount of contaminated groundwater, amount of spent fuel to be disposed).
3. What was the decision process and regulatory framework used to define the end state? Who was involved? Do Stakeholders agree? Who are the stakeholders? Are they the right ones?
4. What are the stewardship activities contemplated and what media or contaminants will need to be monitored or what measurements will need to be made to assure the validity of the assumptions? (e.g., radionuclides X, Y, and Z in monitoring wells, VOCs in air, moisture infiltration in landfill covers, corrosion rates of SNF storage containers, moisture in SNF dry storage facilities, measures of structural integrity at a stabilized nuclear facility, soil erosion).
5. What are the cost elements or drivers associated with anticipated LTS activities? (e.g., labor costs associated with sampling, maintenance costs of engineered barriers, surface radiation surveys or radiation monitoring of stabilized nuclear facilities, analytical laboratory costs, security or access control).
6. What are the expected regulatory/compliance drivers of anticipated LTS activities, and how do they impact the magnitude or cost of those activities? Try to make a distinction between the regulatory regime affecting cleanup or stabilization vs. LTS.
7. How would you prioritize your LTS activities? By risk to human health, environmental impact, program cost, or other parameter?
8. What baseline technologies are being considered or would you consider to accomplish LTS? (e.g., use of latest air/groundwater monitoring techniques utilizing satellite data transfer systems).
9. What is the contemplated schedule for beginning LTS activities? When will you require the solutions to meet your needs? (e.g., cleanup is scheduled for completion by FY-05, will need demonstrated LTS solution by FY-01).
10. What types of information will be important to collect, store, retrieve and interpret to ensure that the hazards are understood for generations to come. Are your information management systems adequate to accomplish the task of LTS? (i.e., can you assure that systems are in place to accommodate long-term storage, retrieval, and access of data?)
11. What would you expect to be the most difficult task associated with LTS?
12. What would you expect to be the most costly element of the LTS program?
13. Who or what will you be trying to protect after cleanup is complete (e.g., workers, ranchers, potential intruders, local biota, drinking water) and for how long? What specific needs do you have to ensure protection of human health and the environment after cleanup is complete? (e.g., facility monitoring systems that can detect changes in entombment systems, ability to monitor contaminant concentrations and migration, etc.).

14. What feedback mechanisms will be used to determine when changes to frequency, magnitude, location, contaminants monitored, duration, or other parameters of the LTS program need to be changed based on monitoring results, new or improved technologies, or regulatory changes?
15. What are some scenarios that could lead to changes in the site/facility end state? (e.g., failure or compromise of engineered barrier from subsidence or bio-intrusion, degradation of concrete or grout leading to potential release of long-lived radionuclides from an entombed facility, corrosion of spent fuel canisters).
16. What are the key assumptions upon which predictive models or risk assessments are based and what needs to be done to determine if these have changed? Who monitors for these changes and how and at what frequency?
17. What major uncertainties exist? (e.g., durability of engineered caps or barriers, life expectancy of long-term grout containment, particular variables in fate and transport models, etc.).
18. Are you aware of any anticipated or potential regulatory issues that may impact your ability to accomplish your LTS mission? (e.g., a regulatory change in acceptable contamination levels, future radiation exposure standards, etc.) Are there regulatory changes that would be desirable to have a positive impact on LTS activities?
19. Are you confident of your ability to accurately assess the LTS-related life-cycle costs associated with remedies already in place or alternative remedies being considered? (i.e., do you have a sound basis for estimates prepared or submitted? Are they defensible? Is the time frame used reasonable? Realistic? Do your estimates include contingency factors? If so, what are they based on?).
20. What is the most unreliable task associated with anticipated LTS activities?
21. Have you considered ways you could avoid or significantly reduce the cost or magnitude of LTS activities? What are they? What are the impediments to being able to implement such solutions/remedies? Do you have any thoughts as to whether better science and/or technology could overcome those impediments?
22. How would you envision R&D, operations, and LTS being integrated?
23. Are you aware of any special needs not yet described? (i.e., other needs not fully defined or characterized).

# Long-Term Stewardship Screening Criteria

**Go/No-go Criterion:** Does this need deal with post-cleanup, -disposal or -stabilization activities?

## **Additional Screening Questions:**

1. Does it pertain to site maintenance?
2. Is it or does it relate to final engineered system performance?
3. Does it involve long term monitoring and surveillance?
4. Does it contribute to greater understanding of fate and transport?
5. Does it improve data management?
6. Does it enhance overall confidence in risk prediction?
7. Does it pertain to a Non S&T need?
8. Does it enhance the ability to respond to failure in final configuration?

## **Categories and Attributes:**

Applies to Waste Form or Physical Barriers?

- Durability
- Maintainability
- Ease of Monitoring
- Predictability
- Frequency of Inspection
- Cost of Inspection
- Contaminated Site Type
  1. *Soil*
  2. *Water*
  3. *Engineered Units*
  4. *Facilities*

Related to Data Collection/Transmission?

- Sensor/Device
- Durability
- Maintainability
- Calibration
- Frequency of Inspection
- Cost of Inspection
- Contaminated Site Type
  1. *Soil*
  2. *Water*
  3. *Engineered Units*
  4. *Facilities*

#### Deals with Information Management

- Data Analysis
- Data Interpretation
- Reporting
- Accessibility
- Retention
- Records Management
- Cost of Records Management
- Contaminated Site Type
  1. *Soil*
  2. *Water*
  3. *Engineered Units*
  4. *Facilities*

#### Related to Environmental Setting and System Performance Characteristics

- Contaminant Modeling
- Fate and Transport
- Toxicity
- Ecological Indicators
- Uncertainty Analysis
- Subsurface Issues
- Model Validation
- System Performance Validation
- Contaminated Site Type
  1. *Soil*
  2. *Water*
  3. *Engineered Units*
  4. *Facilities*

#### Cross Cutting Issues

- Long Term Monitoring and Surveillance
- Risk
- Contaminated Site Type
  1. *Soil*
  2. *Water*
  3. *Engineered Units*
  4. *Facilities*

# **LTS Screening Criteria Terms and Definitions**

Post Cleanup – this refers to the time after all cleanup, stabilization and disposal has taken place and continues until the site has been released for unrestricted use.

Site Maintenance - This refers to those LTS activities that are strictly routine maintenance in nature. That is they are expected and planned for. These activities can include the environmental setting as well as any physical manmade structures.

Engineered System Performance – this refers to the fact that any manmade system structure or component will have associated with it a performance standard. It can be as simple as a sign whose lettering is designed to last 5 years, or as robust as a vitrified waste form designed to last 1000 years.

Long Term Monitoring – refers to those monitoring activities that begin or continue after cleanup, stabilization or disposal. This would include items such as groundwater and surface water monitoring.

Fate and Transport – this refers to those processes that affect the movement, behavior and condition of contaminants and include physical, biological, chemical and nuclear transformations. Processes like volatilization, biodegradation, oxidation, and radioactive decay are examples of such transformations.

Near and Far Field – this refers to the differing aspects of the problem. Near field problems can relate to the source term and its interaction with its immediate surrounding. Far field refers to matters several meters to kilometers from the source. Groundwater contamination is an example of a far field matter.

Data Management – refers to the whole suite of activities associated with the LTS data. It includes not only the collection, but also the analysis, interpretation, presentation, and retention of the data.

Non Science and Technology (S&T) matters – There are a lot of long term stewardship issues that are not S&T related, among these being stakeholder acceptance, institutional controls such as deed restrictions, economic projections, etc.

Durability – refers to the ability of an item, be it a waste form, a physical barrier, a sensor, etc., to last, to be able to withstand wear and tear.

Maintainability – refers to the ability to keep in a good condition and efficiency.

Ease of Monitoring – refers to monitoring that is easy to do, no great difficulty or effort is involved.

Predictability – refers to the condition of being able to understand and forecast the future with respect to the LTS site. This can include episodic environmental events such as flooding as well as how long a warning sign will last.

Calibration – refers to those activities associated with the systematic checking and adjusting of instrumentation.

Data Analysis – refers to those activities associated with the processes of going from raw data to final data and includes items such as verification, validation, and necessary computations.

Data Interpretation – refers to those activities associated with taking the finished data and making sense of what it all means, comparison to regulatory standards, comparison to predictive models, and presenting the results to interested parties.

Contaminant Modeling – refers to those activities associated with understanding, describing and predicting the movement of contaminants through the environment. Typically this is done with computers.

Toxicity – refers to those items that relate to the adverse effects that a contaminant might have on humans, plants or animals.

Ecological Indicators – refers to those items that indicate the health or impact of the surrounding ecology.

Uncertainty Analysis – refers to those activities associated with understanding the key site-related attributes and assumptions that contribute most to the uncertainty of the risk calculations

Subsurface Issues – refers to the whole suite of activities needed to understand the behavior and movement of contaminants in the subsurface.

Model Validation – refers to those activities necessary to confirm the accuracy of the model results.

System Performance Validation – refers to those activities necessary to confirm and assure that the residual hazards and the associated barriers and environmental setting are behaving as expected.

Surveillance – refers to those activities associated with observing the site and its environs.

Risk – refers to those activities associated with determination of the impacts of the contaminants to human health including the worker and the public as well as the environment.

Frequency of inspection – refers to those activities associated with how often an inspection needs to take place. Generally speaking less frequent is better.



## **Attachment A -- Matrix Template**

NEED CODE:

NEED TITLE:

PLAIN LANGUAGE:

## SCREENING QUESTIONS

Pertains to site maintenance

Relates to final engineered system performance

Improves data management

Contributes to better understanding of fate and transport

Involves long term monitoring and surveillance

Pertains to non S and T

Better confidence in risk prediction

Enhances ability to respond to failure in final configuration

## SCREENING CATEGORIES

<div>Waste Form/ Physical Barriers</div> <div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facilities</div>	<div>Data Collection/ Transmission</div> <div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facilities</div>	<div>Information Management</div> <div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facilities</div>	<div>Environmental Setting</div> <div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facilities</div>	<div>Cross Cutting</div> <div>Long-Term Monitoring Risk Water Soil Engineered Units Facilities</div>
--	--	---	---	--

## **Attachment B – List of All LTS Needs**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S & T
AL-00-01-04-SC	Long-term Monitoring Strategies and Techniques to Evaluate the Design of Material Disposal Area Engineered Covers	S&M,CC	EU	Improved Methods of Monitoring the Performance Or Stability of Engineered Caps Or Covers; Cost Savings Is a Goal.	
AL-09-01-01-SC-S	Transport of HE and Metals In Fractured Rock and Surface Alluvial Systems	SS	S,W	Improved Understanding of the Movement of High Explosives (RDX) Components and Metal Contaminants (particularly Barium) Below Ground.	
AL-09-01-03-SC-S	Succession and Long-term Performance of Landfill Covers	CC	EU	Effects On the Performance of Landfill Covers Caused By Plant Succession.	
AL-09-01-06-SC-S	Issue of Scale In Flow Prediction and Contaminant Remediation In Porous Media	SS	S,W	Improved Ability to Predict Flow and Transport Below Ground That Captures the Large and Small Scale Physical Processes That Affect Water Movement.	
AL-09-01-07-SC-S	Integration of Reactive Chemistry Into Field-scale Transport Models	SS	S,W	Improved Predictive Modeling Capabilities That Address Complex Chemical and Flow Processes.	
AL-09-01-08-SC-S	Differences Between Saturated and Unsaturated Systems	SS	S,W	Contaminants Travel Differently In Wet and Dry Below Ground Environments. There Is a Need to Better Understand the Differences.	
AL-09-01-10-SC-S	Physics of Fracture Flow and Transport In the Vadose Zone	SS	S,W	Better Understanding of the Importance of Cracks In Below Ground Water Movement Will Improve Models.	

**Legend:**    **S&M = Surveillance and Monitoring**  
**CC = Caps and Covers**  
**SS = Subsurface Science**

**PB = Physical Barriers**  
**Eco = Ecosystem Monitoring**  
**Tox = Toxicity**

**W = Water**  
**S = Soil**  
**F = Facilities**  
**EU = Engineered Units**

**Appendix A, Attachment B**

**03-Aug-00**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
AL-09-01-11-SC-S	Water Fluxes and Solute Transport In Arid and Semiarid Environments	SS	S,W	Better Understanding of Water Movement Over Time and Area In Arid and Semi-arid Underground Environments, and Water Vapor Exchange At the Ground Surface.	
AL-09-01-12-SC-S	Groundwater-surface Water Interactions	SS	S,W	Better Understanding of the Interaction Between Groundwater and Surface Water, i.e., What Affect Does Groundwater Pumping Have On Streamflow, and What Affect Does Surface Water Diversion Have On Groundwater Recharge.	
AL-09-01-15-SC-S	Separation of Metals and Radionuclides From Uncontaminated Soils; Transport of Metals and Radionuclides In Sediments and Surface Alluvial Systems	SS	S,W	Better Understanding of the Separation and Movement of Metals and Radionuclides From Soils and Sediment.	
AL-09-01-16-RISK-S	Extrapolation Bias and Uncertainty From Using Biomarkers and Numerical Models to Predict Real Ecological Effects	ECO	S,W	A Better Understanding of the Relationship Between Field Data and Model Assumptions to Quantify the Uncertainty of Model Predictions of Ecological Risk.	
AL-09-01-33-NM	Core Scientific R&D Capability In Support of Nuclear Material Management Needs			Need For Retention of Scientific Expertise (Chemistry and Physics) Related to Safety and Health Issues For Stabilization and Storage of Nuclear Materials.	x
AL-09-02-01-SC	Long-term Site Monitoring System	S&M	S,W,EU,F	Improved Site Monitoring and Surveillance System Resulting In Cost Reductions.	

**Legend:**    **S&M = Surveillance and Monitoring**  
**CC = Caps and Covers**  
**SS = Subsurface Science**

**PB = Physical Barriers**  
**Eco = Ecosystem Monitoring**  
**Tox = Toxicity**

**W = Water**  
**S = Soil**  
**F = Facilities**  
**EU = Engineered Units**

**Appendix A, Attachment B**

**03-Aug-00**

# All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
AL-09-02-02-SC	Environmental Restoration (ER) Site Hazard InformationIM System	IM	S,W,EU,F	Need to Develop An Information System to Ensure the Availability and Retrievability of Site Hazard Information In Real-time For Future Site Activities (including Emergency Response)	
CH-SS04-99	Long-term Groundwater Monitoring	S&M	W	Need For Enhanced Or New Monitoring Techniques That Allow More Reliable, Quick and Inexpensive Groundwater Analysis.	
ID-1.1.05	Detect Interactions Between Spent Nuclear Fuel and Storage Containers	S&M,PB	EU	Technology Needed to Detect Corrosion of SNF and Storage Containers.	
ID-6.1.02	Real-time Field Instrumentation For Characterization and Monitoring Soils and Groundwater.	S&M	S,W	Rapid and Accurate Instrumentation Needed to Identify Groundwater and Soil Contamination, Concentrations to Compare With Risk-based Levels.	
ID-6.1.27	Integrated Suite of In Situ Instruments to Determine Flux In the Vadose Zone.	S&M,SS	S,W	Integrated Tools and Devices Are Needed to Directly Measure Contaminant Flux As Key Modeling Input to Improve Predictions.	
ID-6.1.30	Instrumentation to Reliably Measure Soil Gas Flux Accounting For Barometric and Temporal Variations.	S&M,SS	S	The Ability to Quantify the Affects of Natural Changes In Temperature and Barometric Pressure On the Movements of Organics In Soil.	
ID-6.1.34	Improved Passive Vapor Extraction Technology.	SS	S,W	Better Understanding of Natural Changes In Temperature and Pressure That Affect Soil Gas Movement to Depths of 600 Feet Vs. the Current Capability of 20 Feet.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ID-S.1.01	Microbial Alteration of Heavy Metal and Radionuclide Partitioning At Mineral Surfaces	SS	S,W	Need to Study Biological Processes That Affect Mobility and Partitioning of Heavy Metals and Rad Contaminants.	
ID-S.1.04	Real-time Field Instrumentation For Characterization and Monitoring Soils and Groundwater.	S&M	S,W	Need Is For Faster and Cheaper Detection Devices to Aid In Soil and Groundwater Characterization, Sampling and Monitoring of Contaminants Below Ground.	
ID-S.1.09	Characterization of Scale and Spatial Heterogeneity and Preferential Flow	SS	S,W	Need to Improve the Ability to Predict Flow and Transport Modeling of Contamination Below Ground. This Deals With the Uneven Distribution of Contaminant Pathways and Our Ability to Predict Preferential Flow.	
ID-S.1.10	Geochemistry of Contaminants In the Vadose Zone	SS	S,W	Need For Better Understanding of Interaction Between Geology and Contaminants Below Ground. Will Improve Movement Predictions.	
ID-S.1.11	Modeling of Flow and Transport In the Vadose Zone	SS	S,W	Improve Modeling For Contaminant Movement Below Ground.	
ID-S.1.12	Understanding the Behavior of Waste Forms and Their Near-field Transport	PB	EU	Need to Improve Conceptual Models to More Accurately Estimate Releases From Contaminant Waste Forms.	
ID-S.1.14	Transport of Contaminants In the Vapor Phase	SS	S,W	Better Understanding and Characterization of How Contaminants Move In the Soil Gas Phase Below Ground.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment B**

**03-Aug-00**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ID-S.1.15	Physics of Flow In the Vadose Zone	SS	S,W	Need to Conduct Research to Improve Our Ability to Quantify and Predict Contaminant Transport In Below Ground.	
ID-S.1.16	Quantifying Uncertainty In Risk Calculations	TOX		A Better Understanding of the Health Effects of Mixtures of Contaminants and Quantifying the Uncertainties of Health Effects Will Improve Risk Calculations.	
ID-S.1.17	Development of Sensors For Large Scale Measurements In the Vadose Zone to Define Spatial Variability.	S&M,SS	S,W	Need to Develop Indirect Sensors For Large Volume Measurements For Things Like Moisture Content, Pressure and Contaminant Concentration to Enhance Modeling Capability.	
ID-S.1.18	Development of Indirect Sensing Instrumentation For Spatial Variability Analyses of State Variables	S&M,SS	S,W	A Method Is Needed to Obtain a Cost-effective Technique to Map Moisture Content, Pressure and Contaminant Concentration Between Boreholes Below Ground.	
ID-S.1.19	In Situ Biologic Activity Sensor For Vadose Zone and Groundwater Monitoring, Characterization and Remediation.	S&M,SS	S,W	Need to Develop Devices and Instruments to Measure Biological Activity Far Below Ground. Indicates Contaminant Decay to Predict Concentrations At Sites.	
nv01-0001-01s	Down Hole Real Time Monitoring of Radiation(mainly Tritium) In Boreholes	S&M	W	An Instrument Is Needed to Perform Daily Low-level Radiation Measurements In Deep Monitoring Wells. Other Needed Measurements Are Temperature, pH, Electrical Conductivity, Water Level, and Total Gamma.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00



## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
nv02-0001-02S	Deep Well Sampling	S&M	W	A Cost-effective Well Design and Sampling Technology Is Needed For Sampling Groundwater For Radionuclides and Other Physical and Chemical Parameters In Deep (up to 1,500 Meters) Wells In Remote Areas.	
nv11-0001-08	Long Term Management of Void Space, Containers, and Cover Subsidence Disposed Waste	CC	EU	Methods Need to Be Developed to Better Predict the Dynamics of Collapse of Void Space, Container/waste Form Degradation, and Subsidence of Cap Materials.	
nv12-0001-06	Long Term, Flexible Arid Site Closure Cover	CC	EU	Development of a Long-lasting, Cost-effective Closure Caps For Desert Conditions Like Those At NTS Is Needed.	
nv18-0001-07S	Optimizing Monitoring of Contaminant Transport and Subsidence In the Vadose Zone of Low Level Radioactive Waste Sites	S&M	S,W,EU,F	Need to Develop Systems That Can Verify Site Conditions and Provide An Early Warning of the Rate of Transport of Waste Contaminants Along Transport Pathways.	
ods-int-gjpo-1.1	Noxious Weed Control	S&M	S	Need to Develop More Cost Effective, Long Term Noxious Weed Control Methods.	
ods-int-gjpo-1.2	Long-life Signage	S&M,PB	EU	Need For Improved, More Durable Signs That Are More Resistant to Weather and Vandalism.	
ods-int-gjpo-1.3	Ways to Strengthen Physical Or Institutional Controls	PB	EU	Need For Improved Physical Barriers and Intrusion Prevention Systems.	

**Legend:**    **S&M = Surveillance and Monitoring**  
**CC = Caps and Covers**  
**SS = Subsurface Science**

**PB = Physical Barriers**  
**Eco = Ecosystem Monitoring**  
**Tox = Toxicity**

**W = Water**  
**S = Soil**  
**F = Facilities**  
**EU = Engineered Units**

**Appendix A, Attachment B**

**03-Aug-00**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-int-gjpo-1.4	Down-hole Monitors	S&M	S,W	Need to Develop An In-situ Monitoring Device That Can Analyze and Transmit the Data Remotely.	
ods-int-gjpo-1.5	Ways to Measure Moisture Flows In Caps	S&M,CC	EU	Need to Develop a More Cost Effective, Remotely Operated Device to Measure Moisture In/under Caps and Covers.	
ods-int-id-1.3	Capability to Monitor Contaminant Movement Within Structures	S&M	EU,F	There Is a Need For the Capability to Monitor Structures, Both Internally and Externally, to Ensure Migration of Contaminants Is Not Occurring and/or to Provide Early Detection.	
ods-int-id-1.4	Policy For Determining Level of Security For Access Control			A Policy Is Needed to Determine the Level of Security (Access Control) Required For An Entombed Facility/structure.	x
ods-int-id-1.5	Uniform DOE Policy For Stakeholder Issues			Need For a National Policy That Addresses Stakeholder Concerns About Entombment/D&D Practices That Apply to All Sites Uniformly.	x
ods-int-id-10.3	Real Time Detection of Below Ground Releases	S&M	S,W	Need to Develop a Real Time Sensor Device to Detect Below Ground Leaks, Spills, Or Releases of Contaminants Before Reaching Ground/surface Water.	
ods-int-id-10.4	Embedded Monitoring Devices Or Sensors	S&M	F	Need to Develop An Embedded Device to Detect Contamination Releases In High Level Waste Tanks and Storage Structures That Have Been Remediated.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-int-id-2.1	Better Surveying and Monitoring Devices	S&M	S,F,EU	A Need For Improved Contaminant Monitoring Below a Facility Left In Place and a Method to Detect Possible Subsidence of Capped Engineered Units.	
ods-int-id-2.2	More Durable Sensors to Monitor Contaminant Movement	S&M	S,W	A Need to Develop More Durable Sensors to Monitor Contaminant Movement Below Structures.	
ods-int-id-3.1	In-situ Samplers to Detect Contaminant Movement	S&M	S,W	A Need For In-situ Samplers That Can Detect and Send Data Remotely, With Little/no Human Intervention.	
ods-int-id-4.1	Long-term Information and Records Management System	IM	S,W,EU,F	Need For Long-term Records Management System.	
ods-int-id-5.2	Method to Monitor Impacts of Changes On Modeling Requirements and Toxicity Data			Need Method to Monitor the Impacts of Changes On Modeling Requirements and Toxicity Data.	x
ods-int-id-6.1	Sensor Array In SDA to Detect Moisture Infiltration	S&M	EU	Need to Develop a Sensor Array In the Soil Cover Over the Subsurface Disposal Area to Detect Moisture Infiltration.	
ods-int-id-6.2	Reliable Monitoring Network For Groundwater	S&M	W	Need to Develop a Reliable Monitoring Network For Groundwater.	
ods-int-id-6.3	Leachate Detection and Collection As a Backup System	S&M	S,W	Need to Develop a Leachate Detection/collection Backup System In-situ.	
ods-int-id-6.4	Improved Closure Cap Cover Design and Monitoring System	CC	EU	Need to Design a Closure Cap/cover and Monitoring System to Maintain Integrity Over the Long Term.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-int-id-7.1	Need to Monitor Groundwater, Ecological Indicators	S&M	S,W,EU,F	Need to Monitor Groundwater, Ecological Receptors, Soil and Air (rad) Monitoring, Cap Integrity and Moisture, Plant and Animal Intrusion Into Caps.	
ods-int-id-7.2	Need to Determine Cap Durability	CC	EU	Need to Improve Cap Durability and a Better Understanding of Contaminant Retention Rates, Dispersivity, Plant Uptake Factors, Bio-accumulation Rates, Fracture Flow Rates, and Boundary Conditions.	
ods-int-id-7.3	Better/cheaper Methods of Collecting and Analyzing Samples	S&M	S,W	A need For Real-time Monitoring and Alarms, (e.g., Inline Sensors For Nitrate At INTEC Effluent), Down-hole Sensors, and Real-time Monitoring For Air Contaminants. Need For Sensors to Measure Water Level In Wells (real Time). For Tritium, There Is A Need For Continuous Monitoring.	
ods-int-id-7.4	Groundwater Monitoring Using Electronic Data Transmission	IM	S,W,EU,F	Need to Capture Groundwater Data, Unexploded Ordnance Locations, and General Records, and Official Records (including Log Books) In Perpetuity. Need For Comprehensive Site-wide Data Storage System.	
ods-int-id-7.5	Ecological Monitoring, Data Management	S&M	S,W	Need For Improved Ecological Monitoring Capabilities to Detect Subtle Changes In Ecological Indicators.	
ods-int-id-7.6	Improved Well Integrity and Closure	S&M	W	Need For Improved Well Designs to Enhance Long Term Well Durability and Maintainability.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-int-id-8.1	Sensors That Can Be Inserted Into Grout	S&M	EU,F	Need to Develop In-situ Grout Integrity Sensors.	
ods-int-id-8.2	Ways to Quantify Moisture In/under Caps	S&M,CC	EU,S	Need to Develop Capability to Quantify Moisture In and Under Covers/caps.	
ods-int-id-8.3	Probes For Isotopic Measurement	S&M	S,W,EU	Need a Device to Measure Radio-isotopes In-situ.	
ods-int-ws-1.1	Embedded Radon Sensor	S&M	S,EU	Need For a Below Ground Monitor/sensor Device to Detect Radon At the Top of the Radon Barrier Instead of At the Surface of the Cap.	
ods-memo-id-1.1	Cost Effective Methods For LTS Monitoring and Surveillance	S&M	S,W,EU,F	The Need to Evaluate the Use of In-situ Analytical Techniques Or Remote Monitoring to Replace Current Techniques of Sampling and Analysis to Reduce Costs.	
ods-memo-id-1.2	Reliable Risk Assessment Methodology and Fate and Transport Modeling to Support LTS	SS	S,W	A Need to Reduce the Uncertainty In Risk Predictions to Decrease the Cost of Stewardship Activities.	
ods-memo-id-1.3	Methods to Support the Integration of Land Management With LTS			Need to Evaluate the Impact of End-State Decisions On Future Land-use Options.	x
ods-memo-id-1.4	Engineering Solutions For Permanent Control of Residual Contamination and Waste Left In Place	PB,CC	EU,F	Need For a Better Understanding of Long-term Performance of Engineered Solutions.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-memo-id-1.5	Strong Cost Estimating Tools For LTS			A Need For Better Tools For Defensible Life-cycle Cost Estimates For LTS.	x
ods-memo-id-1.6	Tools For the Management For Information of Future Generations	IM	S,W,EU,F	Need to Develop Tools to Ensure Information Management and Transfer to Future Generations.	
ods-memo-oh-1.1	Long Term Record Keeping and Retrievability	IM	S,W,EU,F	Need to Develop a Record Keeping System That Is Easily Accessed and Maintained.	
ods-memo-oh-1.10	Remote Sensing and Monitoring of Vegetation	S&M	EU,S	Need to Develop Remote Sensing Technology to Monitor Long Term Health of Vegetation On Disposal Facility Covers and Ecosystem.	
ods-memo-oh-1.11	Integrated Real Time Sensor and Data Transmission System	S&M	S,W,EU,F	Need to Develop Integrated System to Collect, Store and Transmit Data In Real Time.	
ods-memo-oh-1.12	Automated X-ray System to Examine Disposal Cell	S&M	EU	Need to Develop Automated System to Examine Contents of Disposal Cell Post Closure.	
ods-memo-oh-1.13	Real-time Leachate Detection and Measurement System	S&M	EU	Need to Develop a Real-time, Monitoring and Sensing System to Determine the Integrity of Leachate Collection Systems and Detect Leaks In Collection System Lines.	
ods-memo-oh-1.14	Passive Treatment of Leachate	S&M	EU	Need to Develop a Process For the Passive Treatment of Leachate.	

**Legend:**    **S&M = Surveillance and Monitoring**  
**CC = Caps and Covers**  
**SS = Subsurface Science**

**PB = Physical Barriers**  
**Eco = Ecosystem Monitoring**  
**Tox = Toxicity**

**W = Water**  
**S = Soil**  
**F = Facilities**  
**EU = Engineered Units**

**Appendix A, Attachment B**

**03-Aug-00**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-memo-oh-1.2	Leachate Collection and Transmission Line Maintenance	S&M	EU	Need to Develop Automated Technology to Unplug Leachate Collection and Transmission Lines.	
ods-memo-oh-1.3	Automated Security System			Need to Develop An Automated Security System.	x
ods-memo-oh-1.4	Perimeter Groundwater Well Monitoring	S&M	W	Need to Develop Automated Technology to Monitor Perimeter Groundwater Wells to Determine Elevation of Water, Detect Contaminants, Etc.	
ods-memo-oh-1.5	Monitoring Biological/chemical Properties of Ponds and Streams (Paddy's Run)	S&M	S,W	Need to Develop Automated Method For Monitoring Biological and Chemical Properties of Ponds and Streams (Paddy's Run)	
ods-memo-oh-1.6	Automated Meteorological Monitoring Stations	S&M	AIR	Need to Construct Real Time Automated Meteorological Monitoring Stations.	
ods-memo-oh-1.7	Disposal Facility Physical Change Monitoring System	S&M,PB	EU,F	Need to Develop Technology to Measure Physical Changes and Differential Subsidence In Disposal Facilities.	
ods-memo-oh-1.8	Detection of Penetrations In Disposal Facilities	S&M,PB	EU,F	Need to Develop Automated Method to Detect Penetrations Or Intrusions of Water/moisture Or Groundwater Into Disposal Facilities.	
ods-memo-oh-1.9	Detection of Erosion and Runoff	S&M	S,W	Need to Develop Automated Technology to Detect, Measure and Monitor Erosion and Runoff From Remediated Areas and Disposal Facilities.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment B**

**03-Aug-00**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-rep-2	LTS Data and Information Management Needs From the Working Draft	IM	S,W,EU,F	There Is a Need For LTS Data Standards For Storage and Use.	
ods-rep-3.1	Better Tools For In-situ Field Measurement	S&M,SS	S,W	Identifies the Need For Better Tools (e.g., In-situ Field Measurement) to Characterize and Accurately Predict (model) Contamination Movement Below Ground.	
ods-rep-3.2	Improved Interagency Coordination			Need For Improved Interagency Coordination Among 18 Specific Research Programs On Hazardous Chemicals and Heavy Metals Directly Related to EM Science Program and DOE Cleanup.	x
ods-rep-3.3	Long-term Emphasis of Research Focus			EM Science Program Should Emphasize Four Research Areas: (1) Characterization of Subsurface Contaminants and the Subsurface, (2) Conceptual Modeling, (3) Containment and Stabilization, (4) Monitoring and Validation.	x
ods-rep-3.4	Methods to Validate Containment and Stabilization	PB	EU,F	A Need For Methods to Validate Containment and Stabilization Systems to Ensure Long-term Protection.	
ods-rep-3.5	Methods For Designing Monitoring Systems to Detect Current Conditions and Changes	S&M	S,W,EU,F	Need to Develop Methods For Designing Monitoring Systems to Detect Both Current Conditions and Changes In System.	
ods-rep-3.6	Research Dealing With Transuranic Contaminants Involving Metals and Radionuclide			Need Specific Research Dealing With Transuranic Contaminants Involving Metals and Radionuclides.	x

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00



## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-rep-3.7	Integration of Research Community to Broaden Community of Researchers			Need to Integrate Research From Government Agencies With Research Capabilities, National Laboratories, Universities, and Industry.	x
ods-rep-4.1	Develop Integrated Solution With Regards to Present and Future Technologies			Need to Identify Present and Future Subsurface Technologies, Technology Gaps, and Combining Them For An "Integrated Solution."	x
ods-rep-4.2	Full Capabilities of Vadose Zone Characterization, Prediction, and Monitoring	SS	S,W	A Better Understanding of Below Ground Characterization, Prediction, and Monitoring.	
ods-rep-4.3	Better Analysis and Assessment Stages For Repository Sites	PB	EU	Need For An Improved Repository Design That Creates No Undue Future Risks.	
ods-rep-4.4	Validation Data Through Model Adjustments	SS	S,W	A Need For Site Characterization Data to Validate Model Predictions.	
ods-rep-4.5	Need For Predicting Contaminant Transport Through the Vadose Zone	SS	S,W	Need to Predict Contaminant Transport Below Ground Using a Three-step Iterative Process.	
ods-rep-4.6	Field Scale Research	SS	S,W	Need to Use Field Data Gathered Over Long Periods of Time to Accurately Predict Contaminant Movement and Behavior.	
ods-rep-4.7	Ambient Monitoring, Performance Monitoring and Detection Monitoring	S&M	S,W,EU,F	A Complete Long Term Monitoring System Includes the Need For Ambient, Performance, and Detection Monitoring.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
ods-rep-8-nm-1.1	Cost Effective Monitoring and Surveillance Techniques	S&M	S,W,EU,F	Need For Improved, Cost Effective, Monitoring and Surveillance Techniques.	
ods-rep-8-tn-1.1	Enhanced Reliability of Engineered Controls	PB	EU,F	Need For Improved Ability to Predict and Assess Long-term Performance of Engineered Controls (Isolation Caps and Trenches, Reactive Barriers, etc) and Monitoring Systems.	
ods-rep-8-tn-1.3	Remote Monitoring Techniques	S&M,CC	EU	the Need For Remote Monitoring of Caps, Covers and Trenches to Detect Failures, Possibly Using Satellite Technology.	
ods-rep-8-tn-1.5	Insitu Biological Monitoring to Replace Analytical Monitoring	S&M	EU	Need For Insitu Biological Monitoring to Supplement and Eventually Replace Traditional Analytical Monitoring.	
ods-rep-emsp-1.1	Contaminant Monitors and Diagnostic Parameters	S&M	S,W,EU,F	Need to Develop Improved Sensors and Define Diagnostic Parameters to Identify and Characterize the Presence of Contaminants In All Media.	
ods-rep-emsp-1.2	Sensors to Monitor Physical Integrity of Barriers, Structures and Landfills	S&M,PB	EU,F	Need to Develop Improved Sensors to Monitor Physical Integrity of Barriers, Structures and Landfills Post-closure.	
ods-rep-emsp-1.3	Remote Sensing of Ecosystems	S&M,ECO	S,W	Need to Develop Improved Remote Sensing of Ecosystem Indicators Including Vegetation.	
oh-f048	Long-term Monitoring of Caps and Covers	S&M,CC	EU	Need to Identify Improved Long-term Monitoring of the On-Site Disposal Facility Cover System.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment B**

**03-Aug-00**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
oh-f052	Long-term Treatment and Monitoring of Leachate	S&M	EU	Need For a Stand-alone System to Detect and Treat Leachate After All Other Operating Systems Are Shut Down.	
ORBW-08	Long-term Performance Assessments	SS	S,W,EU,F	Improved Predictive Capabilities For Long-term Performance Assessments Are Needed to Ensure Long-term Reliability.	
ORHY-06	Fractured Media Flow Characterization	SS	S,W	Technologies Are Needed to Predict Fracture Networks, Groundwater Flow and Contaminant Transport Below Ground.	
ORHY-21	Real Time Performance Assessment Monitoring	S&M	S,W	Technologies For Real-time, In Situ Monitoring of Groundwater and Surface Water.	
ORHY-21A	Real Time Performance Assessment Monitoring	S&M	S,W	Technologies For Real-time, In Situ Monitoring of Groundwater and Surface Water (Paducah).	
RF-SNM18	Core Scientific R&D Capability In Support of NMFA Nuclear Material Management Needs			Need For Retention of Scientific Expertise (Chemistry and Physics) Related to Safety and Health Issues For Stabilization and Storage of Nuclear Materials.	x
RL-DD052	Long-term Monitoring Around and Under the 221-U Facility For CDI	S&M	S,W	Technologies Are Needed to Monitor Contaminants In the Soil Around and Under the 221-U Facility to Verify That Contaminants Are Being Contained Now and In the Future.	
RL-SS24-S	Detection/distribution of Contaminants - Chemical Binding On Site-specific Mineral Surfaces	SS	S,W	Research Is Needed to Characterize the Chemical Composition of Microbially-produced, Metal-binding Molecules.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment B**

**03-Aug-00**

# All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
RL-SS25-S	Detection/distribution of Contaminants - Chemical Form and Mobility of Dense, Non-aqueous Phase Liquids In Hanford Subsurface	SS	S,W	Better Understanding of Chemical Form and Mobility of Dense, Non-aqueous Phase Liquids (DNAPLs) Below Ground.	
RL-SS26-s	Transport of Contaminants - Reaction Rates For Key Contaminant Species and Complexes In Site-specific Groundwater	SS	S,W	Determine How and How Fast Contaminants Change Chemical Form and/or Interact With Minerals (e.g., Carbonates) in Soil.	
RL-SS27	Use of Field Data From Representative Sites to Elucidate Controlling Features and Processes For Contaminant Distribution	SS	S,W	Need to Investigate Field Sites to Develop A Better Understanding of Physical and Chemical Processes That Affect Contaminant Distribution Thereby Increasing Confidence In Predicting Contaminant Travel Times.	
RL-SS27-s	Transport of Contaminants - Rate of Coupled Abiotic and Biogeochemical Reactions Involving Contaminants In Hanford Subsurface	SS	S,W	A Better Understanding of the Chemical and Biological Interactions That Affect Contaminant Movement Below Ground.	
RL-SS28	Understand, Quantify and Develop Descriptions of Reactions and Interactions Between Contaminants of Concern and Vadose Zone Sediments	SS	S,W	A Better Understanding of Why Contaminants Become More Or Less Mobile With Longer Contact Times, and the Physical, Chemical, and Biological Causes of Such Changes and How They Are Appropriately Modeled.	
RL-SS28-s	Transport of Contaminants - Rates of Colloid Formation and Colloidal Transport of Contaminants In Site-specific Groundwater	SS	S,W	Need to Determine the Mechanisms and Rates of Production of Inorganic and Organic Colloids In Groundwater, the Rates of Adsorption of Contaminants Onto Colloids, and the Effect of Colloid-facilitated Transport On Contaminant Migration.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
RL-SS29	Develop Descriptions of Contaminant Flow and Transport In the Vadose Zone	SS	S,W	Need to Improve the Modeling of Below Ground Contaminant Movement By Including Additional Processes (e.g., the Coupling of Physical and Chemical Processes), With Finer Grids and Time Spacings, For Better Simulation.	
RL-SS29-s	Transport of Contaminants - Effect of Subsurface Heterogeneities On Chemical Reaction and Transport	SS	S,W	Need to Develop Detection Methods That Provide Adequate Signal Penetration and Reflection/refraction and Account For Sediment Moisture, Grain Size, and Clay Content. Science Is Needed to Determine Chemical Information In Situ As Well.	
RL-SS30	Understand and Quantify Water Movement In the Vadose Zone Using Uncontaminated Field Sites.	SS	S,W	Better Understanding of the Nature and Extent of Preferred Flow Paths Below Ground Along With a Determination of Which Physical Features and Moisture Conditions Affect the Preferred Flow Paths Is Needed.	
RL-SS30-s	Transport of Contaminants - Remedial Technology For Cesium Beneath Waste Tanks	SS	S,W	A Need For An Improved Understanding of the Chemical Processes Affecting Cesium Transport Below Ground In Conjunction With HLW Tank Liquids.	
RL-SS31-s	Remediation - Mathematical Formulations of Chemical Reaction/material Transport	SS	S,W	A Need For Better Computational Tools to Address a Wide Range of Chemical Reactions, and Reaction Rates.	
RL-SS32	Understand and Quantify the Relationship Between Contaminant Sources, Vadose Zone Plume Properties and Groundwater Plume Properties At Hydrologic Boundaries With a Focus On the Groundwater-vadose	SS	S,W	Better Understand the Behavior of Contaminants At the Water Table Boundary.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

**PB = Physical Barriers**  
**Eco = Ecosystem Monitoring**  
**Tox = Toxicity**

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

## Appendix A, Attachment B

**03-Aug-00**

# All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
RL-SS32-s	Remediation - Reactivity of Organics In the Hanford Subsurface	SS	S,W	Better Understanding of the Biodegradation of Halogenated Organic Compounds and Metal/radionuclide Organic Constituents.	
RL-SS33	Techniques to Delineate Groundwater Plumes In Three Dimensions and Define a Scientific Basis For Addressing Scaling Issues In Hanford Groundwater	SS	S,W	Better Understand How to Incorporate Three-dimensional Properties of Contaminated Groundwater and Regional-scale Data Into Predictions of Contaminant Concentration and Distribution.	
RL-SS33-s	Remediation - Interaction of Remedial Processes With Hanford Subsurface	SS	S,W	Need to Measure Reaction Rates of Contaminants Being Remediated and Those Solids, Liquids, and/or Gases Introduced As Part of Remedial Action.	
RL-SS34	Understand, Quantify and Develop Descriptions of Biogeochemical Reactions and Interactions Between Contaminants of Concern and Aquifer Sediments to Describe Biochemical Reactive Transport	SS	S,W	A Better Understanding Is Needed of the Chemical, Physical, and Biological Processes That Affect the Long-term Behavior of Contaminants As They Enter the Aquifer and During Transport to the River.	
RL-SS35	Technologies to Quantify the Flux of Contaminant From Hanford Groundwater to the Columbia River	SS	S,W	Better Understanding of How Contaminants Move to the River (Shoreline, Bed of the River, and How Far Out Into the River), and How Discharges Are Affected By Daily and Seasonal Variations of the River Flows.	
RL-SS35-S	Monitoring of Contaminants - Use of Chemical Surrogates For Contaminants	SS	S,W	Need to Identify An Easy-to-measure Substitute Chemical As An Estimator For a Hard-to-measure Contaminant.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
RL-SS36	Provide Means to Integrate Regional-scale Phenomena Into Assessments of Contaminant Transport and Impacts Within the Columbia River.	SS	S,W	A Need to Model and Understand Regional Effects of Chemical and Physical Components On Contaminant Movement to River Systems.	
RL-SS37	Provide Methodology to Relate Information Derived From Sitewide-scale Groundwater Flow Modeling to the Various Scales Associated With Assessing Impacts In the River Environment	SS	S,W	A Need to Develop Transport Models to Quantify the Changes In Groundwater Characteristics, Flow Path, and Mathematical Computations For Estimating Contaminant Concentrations In the River.	
RL-SS37-S	Monitoring of Contaminants - Chemical Sensor Principles	SS,S&M	S,W	A Better Understanding of the Physics and Chemistry That Will Lead to More Accurate and More Sensitive Measurements of Contaminant Concentrations.	
RL-SS38	Understand, Quantify and Develop Descriptions of Transport and Transformation of Groundwater-derived Contaminants of Concern In the River	SS,S&M	S,W	Develop a System (techniques/equipment/instrumentation) to Measure Chemical, Physical, and Biological Parameters In the Area Between the Aquifer and the River, and to Validate and Verify Models.	
RL-SS39	Understand and Provide Means to Quantify the Impacts of River Contamination On Receptors	TOX		Need to Develop Consistent Ways to Measure Impacts (Human, Ecological, Cultural, Socioeconomic) to Exposed Groups. Information Will Be Used to Determine Toxicity Benchmarks For the Decision-making Process.	

**Legend:**    **S&M = Surveillance and Monitoring**  
**CC = Caps and Covers**  
**SS = Subsurface Science**

**PB = Physical Barriers**  
**Eco = Ecosystem Monitoring**  
**Tox = Toxicity**

**W = Water**  
**S = Soil**  
**F = Facilities**  
**EU = Engineered Units**

**Appendix A, Attachment B**

**03-Aug-00**

## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
RL-SS40	Provide a Method to Develop Mass Balance (i.e., Holistic) Inventory Estimates	IM	S,W,EU,F	There Is a Need For a Single and Consistent Inventory of the Discharges and Disposals of Radionuclides and Chemicals to the Surface and Subsurface.	
RL-SS41	Understand and Quantify the Solubility of Contaminants of Concern At the Waste-Vadose Zone Sediment Interface	SS	S,W	A Better Understanding of Solubility of Certain Contaminants In Various Waste Matrices (e.g., Tc In Tank Waste) and How This Solubility Changes As the Waste Interacts With the Below Ground Sediments.	
RL-WT017	Long-term Testing of Surface Barrier	PB,CC	EU,F	There Is a Need For Better Understanding of Long-term Performance of Surface Barriers to Reduce Moisture Infiltration and Plant and Animal Intrusion.	
RL-WT029	Data and Tools For Performance Assessments	SS	S,W,EU	A Need For Better Estimates of Water Movement Through Buried Waste Over Long Periods In Arid Environments to Reduce Uncertainty of Models.	
RL-WT035-S	Moisture Flow and Contaminant Transport In Arid Conditions	SS	S,W	A Better Understanding of the Soil Physics and Retardation of Contaminants In Soils Under Natural Conditions Is Needed For Dose Calculations.	
RL-WT043-S	Effect of Human and Natural Influences On Long-term Water Distribution	IM	S,W,EU,F	A Need to Better Understand Long Term Land and Water Use At DOE Sites Considering Climate Change and the Ability to Incorporate Impacts of Those Changes Into Models to Predict the Movement of Contaminants.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment B

03-Aug-00



## All LTS Needs

Need Code	Need Title	Category	Contaminated Site Type	Plain Language	Non S&T
RL-WT044-S	Distribution of Recharge Rates	SS	S,W,EU	A Need to Quantify Distribution of Recharge Water Through the Waste Site and the Time Delay Through the Land Surface Into the Water Table.	
RL-WT045-S	Vadose Zone Flow Simulation Tool Under Arid Conditions	SS	S,W	Develop a Simulation Model to Predict the Movement of Contaminants Over Long Periods of Time In Arid Conditions.	
SR00-1026	Reduce the Conservatism and Technical Uncertainty Associated With the Use of Literature Coefficients (Kd) to Describe Radionuclide Sorption to Sediments In Performance Assessment Modeling.	SS	S,W	There Is a Need to Develop Alternative Concepts For Describing Contaminant Separation Beneath Radioactive Waste Disposal Facilities.	
SR00-1030	Model Degradation In Cement Based Wasteform (e.g., Saltstone) and Concrete Vault Degradation and Collapse	PB	EU,F	There Is a Need to Develop a Model to Simulate the Degradation of Saltstone, a Cement-based Wasteform, and the Concrete Vaults Into Which It Is Emplaced Over Time Periods of Thousands of Years.	
SR00-3027	Long Term Monitoring Technologies	S&M	S,W,EU,F	Need to Develop Insitu Remote Monitoring Technologies to Reduce the Cost of Data Collection Associated With Waste Sites.	
SR00-4010	Characterization Data Management	IM	S,W,EU,F	Need to Develop a Relational Database to Allow Storage and Retrieval of Comprehensive Data, Including Photos and Videos Related a D&D Project.	

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment B**

## **Attachment C -- Subsurface Science Needs**

# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
AL-09-01-01-SC-S	Transport of HE and Metals In Fractured Rock and Surface Alluvial Systems	SS	S,W	Improved Understanding of the Movement of High Explosives (RDX) Components and Metal Contaminants (particularly Barium) Below Ground.
AL-09-01-06-SC-S	Issue of Scale In Flow Prediction and Contaminant Remediation In Porous Media	SS	S,W	Improved Ability to Predict Flow and Transport Below Ground That Captures the Large and Small Scale Physical Processes That Affect Water Movement.
AL-09-01-07-SC-S	Integration of Reactive Chemistry Into Field-scale Transport Models	SS	S,W	Improved Predictive Modeling Capabilities That Address Complex Chemical and Flow Processes.
AL-09-01-08-SC-S	Differences Between Saturated and Unsaturated Systems	SS	S,W	Contaminants Travel Differently In Wet and Dry Below Ground Environments. There Is a Need to Better Understand the Differences.
AL-09-01-10-SC-S	Physics of Fracture Flow and Transport In the Vadose Zone	SS	S,W	Better Understanding of the Importance of Cracks In Below Ground Water Movement Will Improve Models.
AL-09-01-11-SC-S	Water Fluxes and Solute Transport In Arid and Semiarid Environments	SS	S,W	Better Understanding of Water Movement Over Time and Area In Arid and Semi-arid Underground Environments, and Water Vapor Exchange At the Ground Surface.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment C**

**03-Aug-00**

# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
AL-09-01-12-SC-S	Groundwater-surface Water Interactions	SS	S,W	Better Understanding of the Interaction Between Groundwater and Surface Water, I.e., What Affect Does Groundwater Pumping Have On Streamflow, and What Affect Does Surface Water Diversion Have On Groundwater Recharge.
AL-09-01-15-SC-S	Separation of Metals and Radionuclides From Uncontaminated Soils; Transport of Metals and Radionuclides In Sediments and Surface Alluvial Systems	SS	S,W	Better Understanding of the Separation and Movement of Metals and Radionuclides From Soils and Sediment.
ID-6.1.27	Integrated Suite of In Situ Instruments to Determine Flux In the Vadose Zone.	S&M,SS	S,W	Integrated Tools and Devices Are Needed to Directly Measure Contaminant Flux As Key Modeling Input to Improve Predictions.
ID-6.1.30	Instrumentation to Reliably Measure Soil Gas Flux Accounting For Barometric and Temporal Variations.	S&M,SS	S	The Ability to Quantify the Affects of Natural Changes In Temperature and Barometric Pressure On the Movements of Organics In Soil.
ID-6.1.34	Improved Passive Vapor Extraction Technology.	SS	S,W	Better Understanding of Natural Changes In Temperature and Pressure That Affect Soil Gas Movement to Depths of 600 Feet vs. the Current Capability of 20 Feet.
ID-S.1.01	Microbial Alteration of Heavy Metal and Radionuclide Partitioning At Mineral Surfaces	SS	S,W	Need to Study Biological Processes That Affect Mobility and Partitioning of Heavy Metals and Rad Contaminants.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment C

03-Aug-00

# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ID-S.1.09	Characterization of Scale and Spatial Heterogeneity and Preferential Flow	SS	S,W	Need to Improve the Ability to Predict Flow and Transport Modeling of Contamination Below Ground. This Deals With the Uneven Distribution of Contaminant Pathways and Our Ability to Predict Preferential Flow.
ID-S.1.10	Geochemistry of Contaminants In the Vadose Zone	SS	S,W	Need For Better Understanding of Interaction Between Geology and Contaminants Below Ground. Will Improve Movement Predictions.
ID-S.1.11	Modeling of Flow and Transport In the Vadose Zone	SS	S,W	Improve Modeling For Contaminant Movement Below Ground.
ID-S.1.14	Transport of Contaminants In the Vapor Phase	SS	S,W	Better Understanding and Characterization of How Contaminants Move In the Soil Gas Phase Below Ground.
ID-S.1.15	Physics of Flow In the Vadose Zone	SS	S,W	Need to Conduct Research to Improve Our Ability to Quantify and Predict Contaminant Transport In Below Ground.
ID-S.1.17	Development of Sensors For Large Scale Measurements In the Vadose Zone to Define Spatial Variability.	S&M,SS	S,W	Need to Develop Indirect Sensors For Large Volume Measurements For Things Like Moisture Content, Pressure and Contaminant Concentration to Enhance Modeling Capability.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment C**

**03-Aug-00**

## Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ID-S.1.18	Development of Indirect Sensing Instrumentation For Spatial Variability Analyses of State Variables	S&M,SS	S,W	A Method Is Needed to Obtain a Cost-effective Technique to Map Moisture Content, Pressure and Contaminant Concentration Between Boreholes Below Ground.
ID-S.1.19	In Situ Biologic Activity Sensor For Vadose Zone and Groundwater Monitoring, Characterization and Remediation.	S&M,SS	S,W	Need to Develop Devices and Instruments to Measure Biological Activity Far Below Ground. Indicates Contaminant Decay to Predict Concentrations At Sites.
ods-memo-id-1.2	Reliable Risk Assessment Methodology and Fate and Transport Modeling to Support LTS	SS	S,W	A Need to Reduce the Uncertainty In Risk Predictions to Decrease the Cost of Stewardship Activities.
ods-rep-3.1	Better Tools For In-situ Field Measurement	S&M,SS	S,W	Identifies the Need For Better Tools (e.g., In-situ Field Measurement) to Characterize and Accurately Predict (Model) Contamination Movement Below Ground.
ods-rep-4.2	Full Capabilities of Vadose Zone Characterization, Prediction, and Monitoring	SS	S,W	A Better Understanding of Below Ground Characterization, Prediction, and Monitoring.
ods-rep-4.4	Validation Data Through Model Adjustments	SS	S,W	A Need For Site Characterization Data to Validate Model Predictions.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment C

03-Aug-00

# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-rep-4.5	Need For Predicting Contaminant Transport Through the Vadose Zone	SS	S,W	Need to Predict Contaminant Transport Below Ground Using a Three-step Iterative Process.
ods-rep-4.6	Field Scale Research	SS	S,W	Need to Use Field Data Gathered Over Long Periods of Time to Accurately Predict Contaminant Movement and Behavior.
ORBW-08	Long-term Performance Assessments	SS	S,W,EU,F	Improved Predictive Capabilities For Long-term Performance Assessments Are Needed to Ensure Long-term Reliability.
ORHY-06	Fractured Media Flow Characterization	SS	S,W	Technologies Are Needed to Predict Fracture Networks, Groundwater Flow and Contaminant Transport Below Ground.
RL-SS24-S	Detection/distribution of Contaminants - Chemical Binding On Site-specific Mineral Surfaces	SS	S,W	Research Is Needed to Characterize the Chemical Composition of Microbially-produced, Metal-binding Molecules.
RL-SS25-S	Detection/distribution of Contaminants - Chemical Form and Mobility of Dense, Non-aqueous Phase Liquids In Hanford Subsurface	SS	S,W	Better Understanding of Chemical Form and Mobility of Dense, Non-aqueous Phase Liquids (DNAPL) Below Ground.
RL-SS26-S	Transport of Contaminants - Reaction Rates For Key Contaminant Species and Complexes In Site-specific Groundwater	SS	S,W	Determine How and How Fast Contaminants Change Chemical Form and/or Interact With Minerals (e.g., Carbonates) In Soil.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment C

03-Aug-00

# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
RL-SS27	Use of Field Data From Representative Sites to Elucidate Controlling Features and Processes For Contaminant Distribution	SS	S,W	Need to Investigate Field Sites to Develop a Better Understanding of Physical and Chemical Processes That Affect Contaminant Distribution Thereby Increasing Confidence In Predicting Contaminant Travel Times.
RL-SS27-S	Transport of Contaminants - Rate of Coupled Abiotic and Biogeochemical Reactions Involving Contaminants In Hanford Subsurface	SS	S,W	A Better Understanding of the Chemical and Biological Interactions That Affect Contaminant Movement Below Ground.
RL-SS28	Understand, Quantify and Develop Descriptions of Reactions and Interactions Between Contaminants of Concern and Vadose Zone Sediments	SS	S,W	A Better Understanding of Why Contaminants Become More Or Less Mobile With Longer Contact Times, and the Physical, Chemical, and Biological Causes of Such Changes and How They Are Appropriately Modeled.
RL-SS28-S	Transport of Contaminants - Rates of Colloid Formation and Colloidal Transport of Contaminants In Site-specific Groundwater	SS	S,W	Need to Determine the Mechanisms and Rates of Production of Inorganic and Organic Colloids In Groundwater, the Rates of Adsorption of Contaminants Onto Colloids, and the Effect of Colloid-facilitated Transport On Contaminant Migration.
RL-SS29	Develop Descriptions of Contaminant Flow and Transport In the Vadose Zone	SS	S,W	Need to Improve the Modeling of Below Ground Contaminant Movement By Including Additional Processes (e.g., the Coupling of Physical and Chemical Processes), With Finer Grids and Time Spacings, For Better Simulation.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment C**

**03-Aug-00**



# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
RL-SS29-S	Transport of Contaminants - Effect of Subsurface Heterogeneities On Chemical Reaction and Transport	SS	S,W	Need to Develop Detection Methods That Provide Adequate Signal Penetration and Reflection/refraction and Account For Sediment Moisture, Grain Size, and Clay Content. Science Is Needed to Determine Chemical Information In Situ As Well.
RL-SS30	Understand and Quantify Water Movement In the Vadose Zone Using Uncontaminated Field Sites.	SS	S,W	Better Understanding of the Nature and Extent of Preferred Flow Paths Below Ground Along With a Determination of Which Physical Features and Moisture Conditions Affect the Preferred Flow Paths Is Needed.
RL-SS30-S	Transport of Contaminants - Remedial Technology For Cesium Beneath Waste Tanks	SS	S,W	A Need For An Improved Understanding of the Chemical Processes Affecting Cesium Transport Below Ground In Conjunction With HLW Tank Liquids.
RL-SS31-S	Remediation - Mathematical Formulations of Chemical Reaction/material Transport	SS	S,W	A Need For Better Computational Tools to Address a Wide Range of Chemical Reactions, and Reaction Rates.
RL-SS32	Understand and Quantify the Relationship Between Contaminant Sources, Vadose Zone Plume Properties and Groundwater Plume Properties At Hydrologic Boundaries With a Focus On the Groundwater-vadose	SS	S,W	Better Understand the Behavior of Contaminants At the Water Table Boundary.
RL-SS32-S	Remediation - Reactivity of Organics In the Hanford Subsurface	SS	S,W	Better Understanding of the Biodegradation of Halogenated Organic Compounds and Metal/radionuclide Organic Constituents.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment C**

**03-Aug-00**

# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
RL-SS33	Techniques to Delineate Groundwater Plumes In Three Dimensions and Define a Scientific Basis For Addressing Scaling Issues In Hanford Groundwater	SS	S,W	Better Understand How to Incorporate Three-dimensional Properties of Contaminated Groundwater and Regional-scale Data Into Predictions of Contaminant Concentration and Distribution.
RL-SS33-S	Remediation - Interaction of Remedial Processes With Hanford Subsurface	SS	S,W	Need to Measure Reaction Rates of Contaminants Being Remediated and Those Solids, Liquids, and/or Gases Introduced As Part of Remedial Action.
RL-SS34	Understand, Quantify and Develop Descriptions of Biogeochemical Reactions and Interactions Between Contaminants of Concern and Aquifer Sediments to Describe Biochemical Reactive Transport	SS	S,W	A Better Understanding Is Needed of the Chemical, Physical, and Biological Processes That Affect the Long-term Behavior of Contaminants As They Enter the Aquifer and During Transport to the River.
RL-SS35	Technologies to Quantify the Flux of Contaminant From Hanford Groundwater to the Columbia River	SS	S,W	Better Understanding of How Contaminants Move to the River (Shoreline, Bed of the River, and How Far Out Into the River), and How Discharges Are Affected By Daily and Seasonal Variations of the River Flows.
RL-SS35-S	Monitoring of Contaminants - Use of Chemical Surrogates For Contaminants	SS	S,W	Need to Identify An Easy-to-measure Substitute Chemical As An Estimator For a Hard-to-measure Contaminant.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment C

03-Aug-00

# Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
RL-SS36	Provide Means to Integrate Regional-scale Phenomena Into Assessments of Contaminant Transport and Impacts Within the Columbia River.	SS	S,W	A Need to Model and Understand Regional Effects of Chemical and Physical Components On Contaminant Movement to River Systems.
RL-SS37	Provide Methodology to Relate Information Derived From Sitewide-scale Groundwater Flow Modeling to the Various Scales Associated With Assessing Impacts In the River Environment	SS	S,W	A Need to Develop Transport Models to Quantify the Changes In Groundwater Characteristics, Flow Path, and Mathematical Computations For Estimating Contaminant Concentrations In the River.
RL-SS37-S	Monitoring of Contaminants - Chemical Sensor Principles	SS,S&M	S,W	A Better Understanding of the Physics and Chemistry That Will Lead to More Accurate and More Sensitive Measurements of Contaminant Concentrations.
RL-SS38	Understand, Quantify and Develop Descriptions of Transport and Transformation of Groundwater-derived Contaminants of Concern In the River	SS,S&M	S,W	Develop a System (techniques/equipment/instrumentation) to Measure Chemical, Physical, and Biological Parameters In the Area Between the Aquifer and the River, and to Validate and Verify Models.
RL-SS41	Understand and Quantify the Solubility of Contaminants of Concern At the Waste-Vadose Zone Sediment Interface	SS	S,W	A Better Understanding of Solubility of Certain Contaminants In Various Waste Matrices (e.g., Tc In Tank Waste) and How This Solubility Changes As the Waste Interacts With the Below Ground Sediments.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment C

03-Aug-00

## Subsurface Science

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
RL-WT029	Data and Tools For Performance Assessments	SS	S,W,EU	A Need For Better Estimates of Water Movement Through Buried Waste Over Long Periods In Arid Environments to Reduce Uncertainty of Models.
RL-WT035-S	Moisture Flow and Contaminant Transport In Arid Conditions	SS	S,W	A Better Understanding of the Soil Physics and Retardation of Contaminants In Soils Under Natural Conditions Is Needed For Dose Calculations.
RL-WT044-S	Distribution of Recharge Rates	SS	S,W,EU	A Need to Quantify Distribution of Recharge Water Through the Waste Site and the Time Delay Through the Land Surface Into the Water Table.
RL-WT045-S	Vadose Zone Flow Simulation Tool Under Arid Conditions	SS	S,W	Develop a Simulation Model to Predict the Movement of Contaminants Over Long Periods of Time In Arid Conditions.
SR00-1026	Reduce the Conservatism and Technical Uncertainty Associated With the Use of Literature Coefficients (Kd) to Describe Radionuclide Sorption to Sediments In Performance Assessment Modeling.	SS	S,W	There Is a Need to Develop Alternative Concepts For Describing Contaminant Separation Beneath Radioactive Waste Disposal Facilities.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment C

03-Aug-00

## **Attachment D -- Surveillance and Monitoring Needs**

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
AL-00-01-04-SC	Long-term Monitoring Strategies and Techniques to Evaluate the Design of Material Disposal Area Engineered Covers	S&M,CC	EU	Improved Methods of Monitoring the Performance Or Stability of Engineered Caps Or Covers; Cost Savings Is a Goal.
AL-09-02-01-SC	Long-term Site Monitoring System	S&M	S,W,EU,F	Improved Site Monitoring and Surveillance System Resulting In Cost Reductions.
ch-ss04-99	Long-term Groundwater Monitoring	S&M	W	Need For Enhanced Or New Monitoring Techniques That Allow More Reliable, Quick and Inexpensive Groundwater Analysis.
ID-1.1.05	Detect Interactions Between Spent Nuclear Fuel and Storage Containers	S&M,PB	EU	Technology Needed to Detect Corrosion of SNF and Storage Containers.
ID-6.1.02	Real-time Field Instrumentation For Characterization and Monitoring Soils and Groundwater.	S&M	S,W	Rapid and Accurate Instrumentation Needed to Identify Groundwater and Soil Contamination, Concentrations to Compare With Risk-based Levels.
ID-6.1.27	Integrated Suite of In Situ Instruments to Determine Flux In the Vadose Zone.	S&M,SS	S,W	Integrated Tools and Devices Are Needed to Directly Measure Contaminant Flux As Key Modeling Input to Improve Predictions.
ID-6.1.30	Instrumentation to Reliably Measure Soil Gas Flux Accounting For Barometric and Temporal Variations.	S&M,SS	S	The Ability to Quantify the Affects of Natural Changes In Temperature and Barometric Pressure On the Movements of Organics In Soil.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ID-S.1.04	Real-time Field Instrumentation For Characterization and Monitoring Soils and Groundwater.	S&M	S,W	Need Is For Faster and Cheaper Detection Devices to Aid In Soil and Groundwater Characterization, Sampling and Monitoring of Contaminants Below Ground.
ID-S.1.17	Development of Sensors For Large Scale Measurements In the Vadose Zone to Define Spatial Variability.	S&M,SS	S,W	Need to Develop Indirect Sensors For Large Volume Measurements For Things Like Moisture Content, Pressure and Contaminant Concentration to Enhance Modeling Capability.
ID-S.1.18	Development of Indirect Sensing Instrumentation For Spatial Variability Analyses of State Variables	S&M,SS	S,W	A Method Is Needed to Obtain a Cost-effective Technique to Map Moisture Content, Pressure and Contaminant Concentration Between Boreholes Below Ground.
ID-S.1.19	In Situ Biologic Activity Sensor For Vadose Zone and Groundwater Monitoring, Characterization and Remediation.	S&M,SS	S,W	Need to Develop Devices and Instruments to Measure Biological Activity Far Below Ground. Indicates Contaminant Decay to Predict Concentrations At Sites.
nv01-0001-01s	Down Hole Real Time Monitoring of Radiation (Mainly Tritium) In Boreholes	S&M	W	An Instrument Is Needed to Perform Daily Low-level Radiation Measurements In Deep Monitoring Wells. Other Needed Measurements Are Temperature, pH, Electrical Conductivity, Water Level, and Total Gamma.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
nv02-0001-02S	Deep Well Sampling	S&M	W	A Cost-effective Well Design and Sampling Technology Is Needed For Sampling Groundwater For Radionuclides and Other Physical and Chemical Parameters In Deep (up to 1,500 Meters) Wells In Remote Areas.
nv18-0001-07S	Optimizing Monitoring of Contaminant Transport and Subsidence In the Vadose Zone of Low Level Radioactive Waste Sites	S&M	S,W,EU,F	Need to Develop Systems That Can Verify Site Conditions and Provide An Early Warning of the Rate of Transport of Waste Contaminants Along Transport Pathways.
ods-int-gjpo-1.1	Noxious Weed Control	S&M	S	Need to Develop More Cost Effective, Long Term Noxious Weed Control Methods.
ods-int-gjpo-1.2	Long-life Signage	S&M,PB	EU	Need For Improved, More Durable Signs That Are More Resistant to Weather and Vandalism.
ods-int-gjpo-1.4	Down-hole Monitors	S&M	S,W	Need to Develop An In-situ Monitoring Device That Can Analyze and Transmit the Data Remotely.
ods-int-gjpo-1.5	Ways to Measure Moisture Flows In Caps	S&M,CC	EU	Need to Develop a More Cost Effective, Remotely Operated Device to Measure Moisture In/under Caps and Covers.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D



# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-int-id-1.3	Capability to Monitor Contaminant Movement Within Structures	S&M	EU,F	There Is a Need For the Capability to Monitor Structures, Both Internally and Externally, to Ensure Migration of Contaminants Is Not Occurring and/or to Provide Early Detection.
ods-int-id-10.3	Real Time Detection of Below Ground Releases	S&M	S,W	Need to Develop a Real Time Sensor Device to Detect Below Ground Leaks, Spills, Or Releases of Contaminants Before Reaching Ground/surface Water.
ods-int-id-10.4	Embedded Monitoring Devices Or Sensors	S&M	F	Need to Develop An Embedded Device to Detect Contamination Releases In High Level Waste Tanks and Storage Structures That Have Been Remediated.
ods-int-id-2.1	Better Surveying and Monitoring Devices	S&M	S,F,EU	A Need For Improved Contaminant Monitoring Below a Facility Left In Place and a Method to Detect Possible Subsidence of Capped Engineered Units.
ods-int-id-2.2	More Durable Sensors to Monitor Contaminant Movement	S&M	S,W	A Need to Develop More Durable Sensors to Monitor Contaminant Movement Below Structures.
ods-int-id-3.1	In-situ Samplers to Detect Contaminant Movement	S&M	S,W	A Need For In-situ Samplers That Can Detect and Send Data Remotely, With Little/no Human Intervention.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-int-id-6.1	Sensor Array In SDA to Detect Moisture Infiltration	S&M	EU	Need to Develop a Sensor Array In the Soil Cover Over the Subsurface Disposal Area to Detect Moisture Infiltration.
ods-int-id-6.2	Reliable Monitoring Network For Groundwater	S&M	W	Need to Develop a Reliable Monitoring Network For Groundwater.
ods-int-id-6.3	Leachate Detection and Collection As a Backup System	S&M	S,W	Need to Develop a Leachate Detection/collection Backup System In-situ.
ods-int-id-7.1	Need to Monitor Groundwater, Ecological Indicators	S&M	S,W,EU,F	Need to Monitor Groundwater, Ecological Receptors, Soil and Air (rad) Monitoring, Cap Integrity and Moisture, Plant and Animal Intrusion Into Caps.
ods-int-id-7.3	Better/cheaper Methods of Collecting and Analyzing Samples	S&M	S,W	A Need For Real-time Monitoring and Alarms, (e.g., Inline Sensors For Nitrate At INTEC Effluent), Down-hole Sensors, and Real-time Monitoring For Air Contaminants. Need For Sensors to Measure Water Level In Wells (real Time). For Tritium, There Is a Need For Continuous Monitoring.
ods-int-id-7.5	Ecological Monitoring, Data Management	S&M	S,W	Need For Improved Ecological Monitoring Capabilities to Detect Subtle Changes In Ecological Indicators.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-int-id-7.6	Improved Well Integrity and Closure	S&M	W	Need For Improved Well Designs to Enhance Long Term Well Durability and Maintainability.
ods-int-id-8.1	Sensors That Can Be Inserted Into Grout	S&M	EU,F	Need to Develop In-situ Grout Integrity Sensors.
ods-int-id-8.2	Ways to Quantify Moisture In/under Caps	S&M,CC	EU,S	Need to Develop Capability to Quantify Moisture In and Under Covers/caps.
ods-int-id-8.3	Probes For Isotopic Measurement	S&M	S,W,EU	Need a Device to Measure Radio-isotopes In-situ.
ods-int-ws-1.1	Embedded Radon Sensor	S&M	S,EU	Need For a Below Ground Monitor/sensor Device to Detect Radon At the Top of the Radon Barrier Instead of At the Surface of the Cap.
ods-memo-id-1.1	Cost Effective Methods For LTS Monitoring and Surveillance	S&M	S,W,EU,F	The Need to Evaluate the Use of In-situ Analytical Techniques Or Remote Monitoring to Replace Current Techniques of Sampling and Analysis to Reduce Costs.
ods-memo-oh-1.10	Remote Sensing and Monitoring of Vegetation	S&M	EU,S	Need to Develop Remote Sensing Technology to Monitor Long Term Health of Vegetation On Disposal Facility Covers and Ecosystem.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**03-Aug-00**

**Appendix A, Attachment D**

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-memo-oh-1.11	Integrated Real Time Sensor and Data Transmission System	S&M	S,W,EU,F	Need to Develop Integrated System to Collect, Store and Transmit Data In Real Time.
ods-memo-oh-1.12	Automated X-ray System to Examine Disposal Cell	S&M	EU	Need to Develop Automated System to Examine Contents of Disposal Cell Post Closure.
ods-memo-oh-1.13	Real-time Leachate Detection and Measurement System	S&M	EU	Need to Develop a Real-time, Monitoring and Sensing System to Determine the Integrity of Leachate Collection Systems and Detect Leaks In Collection System Lines.
ods-memo-oh-1.14	Passive Treatment of Leachate	S&M	EU	Need to Develop a Process For the Passive Treatment of Leachate.
ods-memo-oh-1.2	Leachate Collection and Transmission Line Maintenance	S&M	EU	Need to Develop Automated Technology to Unplug Leachate Collection and Transmission Lines.
ods-memo-oh-1.4	Perimeter Groundwater Well Monitoring	S&M	W	Need to Develop Automated Technology to Monitor Perimeter Groundwater Wells to Determine Elevation of Water, Detect Contaminants, Etc.
ods-memo-oh-1.5	Monitoring Biological/chemical Properties of Ponds and Streams (Paddy's Run)	S&M	S,W	Need to Develop Automated Method For Monitoring Biological and Chemical Properties of Ponds and Streams (Paddy's Run)

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-memo-oh-1.6	Automated Meteorological Monitoring Stations	S&M	AIR	Need to Construct Real Time Automated Meteorological Monitoring Stations.
ods-memo-oh-1.7	Disposal Facility Physical Change Monitoring System	S&M,PB	EU,F	Need to Develop Technology to Measure Physical Changes and Differential Subsidence In Disposal Facilities.
ods-memo-oh-1.8	Detection of Penetrations In Disposal Facilities	S&M,PB	EU,F	Need to Develop Automated Method to Detect Penetrations Or Intrusions of Water/moisture Or Groundwater Into Disposal Facilities.
ods-memo-oh-1.9	Detection of Erosion and Runoff	S&M	S,W	Need to Develop Automated Technology to Detect, Measure and Monitor Erosion and Runoff From Remediated Areas and Disposal Facilities.
ods-rep-3.1	Better Tools For In-situ Field Measurement	S&M,SS	S,W	Identifies the Need For Better Tools (e.g., In-situ Field Measurement) to Characterize and Accurately Predict (model) Contamination Movement Below Ground.
ods-rep-3.5	Methods For Designing Monitoring Systems to Detect Current Conditions and Changes	S&M	S,W,EU,F	Need to Develop Methods For Designing Monitoring Systems to Detect Both Current Conditions and Changes In System.
ods-rep-4.7	Ambient Monitoring, Performance Monitoring and Detection Monitoring	S&M	S,W,EU,F	A Complete Long Term Monitoring System Includes the Need For Ambient, Performance, and Detection Monitoring.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-rep-8-nm-1.1	Cost Effective Monitoring and Surveillance Techniques	S&M	S,W,EU,F	Need For Improved, Cost Effective, Monitoring and Surveillance Techniques.
ods-rep-8-tn-1.3	Remote Monitoring Techniques	S&M,CC	EU	The Need For Remote Monitoring of Caps, Covers and Trenches to Detect Failures, Possibly Using Satellite Technology.
ods-rep-8-tn-1.5	Insitu Biological Monitoring to Replace Analytical Monitoring	S&M	EU	Need For Insitu Biological Monitoring to Supplement and Eventually Replace Traditional Analytical Monitoring.
ods-rep-emsp-1.1	Contaminant Monitors and Diagnostic Parameters	S&M	S,W,EU,F	Need to Develop Improved Sensors and Define Diagnostic Parameters to Identify and Characterize the Presence of Contaminants In All Media.
ods-rep-emsp-1.2	Sensors to Monitor Physical Integrity of Barriers, Structures and Landfills	S&M,PB	EU,F	Need to Develop Improved Sensors to Monitor Physical Integrity of Barriers, Structures and Landfills Post-closure.
ods-rep-emsp-1.3	Remote Sensing of Ecosystems	S&M,ECO	S,W	Need to Develop Improved Remote Sensing of Ecosystem Indicators Including Vegetation.
OH-F048	Long-term Monitoring of Caps and Covers	S&M,CC	EU	Need to Identify Improved Long-term Monitoring of the On-Site Disposal Facility Cover System.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
OH-F052	Long-term Treatment and Monitoring of Leachate	S&M	EU	Need For a Stand-alone System to Detect and Treat Leachate After All Other Operating Systems Are Shut Down.
ORHY-21	Real Time Performance Assessment Monitoring	S&M	S,W	Technologies For Real-time, In Situ Monitoring of Groundwater and Surface Water.
ORHY-21a	Real Time Performance Assessment Monitoring	S&M	S,W	Technologies For Real-time, In Situ Monitoring of Groundwater and Surface Water (Paducah).
RL-DD052	Long-term Monitoring Around and Under the 221-U Facility For CDI	S&M	S,W	Technologies Are Needed to Monitor Contaminants In the Soil Around and Under the 221-U Facility to Verify That Contaminants Are Being Contained Now and In the Future.
RL-SS37-S	Monitoring of Contaminants - Chemical Sensor Principles	SS,S&M	S,W	A Better Understanding of the Physics and Chemistry That Will Lead to More Accurate and More Sensitive Measurements of Contaminant Concentrations.
RL-SS38	Understand, Quantify and Develop Descriptions of Transport and Transformation of Groundwater-derived Contaminants of Concern In the River	SS,S&M	S,W	Develop a System (techniques/equipment/instrumentation) to Measure Chemical, Physical, and Biological Parameters In the Area Between the Aquifer and the River, and to Validate and Verify Models.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D

# Surveillance & Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
SR00-3027	Long Term Monitoring Technologies	S&M	S,W,EU,F	Need to Develop Insitu Remote Monitoring Technologies to Reduce the Cost of Data Collection Associated With Waste Sites.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment D



## **Attachment E -- Caps and Covers Needs**

# Caps and Covers

Need Code	NEED TITLE	Category	Contaminated Site Type	Plain Language
AL-00-01-04-SC	Long-term Monitoring Strategies and Techniques to Evaluate the Design of Material Disposal Area Engineered Covers	S&M,CC	EU	Improved Methods of Monitoring the Performance Or Stability of Engineered Caps Or Covers; Cost Savings Is a Goal.
AL-09-01-03-SC-S	Succession and Long-term Performance of Landfill Covers	CC	EU	Effects On the Performance of Landfill Covers Caused By Plant Succession.
nv11-0001-08	Long Term Management of Void Space, Containers, and Cover Subsidence Disposed Waste	CC	EU	Methods Need to Be Developed to Better Predict the Dynamics of Collapse of Void Space, Container/waste Form Degradation, and Subsidence of Cap Materials.
nv12-0001-06	Long Term, Flexible Arid Site Closure Cover	CC	EU	Development of a Long-lasting, Cost-effective Closure Caps For Desert Conditions Like Those At NTS Is Needed.
ods-int-gjpo-1.5	Ways to Measure Moisture Flows In Caps	S&M,CC	EU	Need to Develop a More Cost Effective, Remotely Operated Device to Measure Moisture In/under Caps and Covers.
ods-int-id-6.4	Improved Closure Cap Cover Design and Monitoring System	CC	EU	Need to Design a Closure Cap/cover and Monitoring System to Maintain Integrity Over the Long Term.
ods-int-id-7.2	Need to Determine Cap Durability	CC	EU	Need to Improve Cap Durability and a Better Understanding of Contaminant Retention Rates, Dispersivity, Plant Uptake Factors, Bio-accumulation Rates, Fracture Flow Rates, and Boundary Conditions.

**Legend:** S&M = Surveillance and  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**Appendix A, Attachment E**

**03-Aug-00**

## Caps and Covers

Need Code	NEED TITLE	Category	Contaminated Site Type	Plain Language
ods-int-id-8.2	Ways to Quantify Moisture In/under Caps	S&M,CC	EU,S	Need to Develop Capability to Quantify Moisture In and Under Covers/caps.
ods-memo-id-1.4	Engineering Solutions For Permanent Control of Residual Contamination and Waste Left In Place	PB,CC	EU,F	Need For a Better Understanding of Long-term Performance of Engineered Solutions.
ods-rep-8-tn-1.3	Remote Monitoring Techniques	S&M,CC	EU	The Need For Remote Monitoring of Caps, Covers and Trenches to Detect Failures, Possibly Using Satellite Technology.
OH-F048	Long-term Monitoring of Caps and Covers	S&M,CC	EU	Need to Identify Improved Long-term Monitoring of the On-Site Disposal Facility Cover System.
RL-WT017	Long-term Testing of Surface Barrier	PB,CC	EU,F	There Is a Need For Better Understanding of Long-term Performance of Surface Barriers to Reduce Moisture Infiltration and Plant and Animal Intrusion.

**Legend:** S&M = Surveillance and  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

Appendix A, Attachment E

03-Aug-00

## **Attachment F -- Information Management Needs**

# Information Management

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
AL-09-02-02-SC	Environmental Restoration (ER) Site Hazard Information System	IM	S,W,EU,F	Need to Develop An Information System to Ensure the Availability and Retrieval of Site Hazard Information In Real-time For Future Site Activities (including Emergency Response)
ods-int-id-4.1	Long-term Information and Records Management System	IM	S,W,EU,F	Need For Long-term Records Management System.
ods-int-id-7.4	Groundwater Monitoring Using Electronic Data Transmission	IM	S,W,EU,F	Need to Capture Groundwater Data, Unexploded Ordnance Locations, and General Records, and Official Records (including Log Books) In Perpetuity. Need For Comprehensive Site-wide Data Storage System.
ods-memo-id-1.6	Tools For the Management For Information of Future Generations	IM	S,W,EU,F	Need to Develop Tools to Ensure Information Management and Transfer to Future Generations.
ods-memo-oh-1.1	Long Term Record Keeping and Retrievalability	IM	S,W,EU,F	Need to Develop a Record Keeping System That Is Easily Accessed and Maintained.
ods-rep-2	LTS Data and Information Management Needs From the Working Draft	IM	S,W,EU,F	There Is a Need For LTS Data Standards For Storage and Use.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment F

# Information Management

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
RL-SS40	Provide a Method to Develop Mass Balance (i.e., Holistic) Inventory Estimates	IM	S,W,EU,F	There Is a Need For a Single and Consistent Inventory of the Discharges and Disposals of Radionuclides and Chemicals to the Surface and Subsurface.
RL-WT043-S	Effect of Human and Natural Influences On Long-term Water Distribution	IM	S,W,EU,F	A Need to Better Understand Long Term Land and Water Use At DOE Sites Considering Climate Change and the Ability to Incorporate Impacts of Those Changes Into Models to Predict the Movement of Contaminants.
SR00-4010	Characterization Data Management	IM	S,W,EU,F	Need to Develop a Relational Database to Allow Storage and Retrieval of Comprehensive Data, Including Photos and Videos Related a D&D Project.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment F

## **Attachment G -- Physical Barriers Needs**

## Physical Barriers

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ID-1.1.05	Detect Interactions Between Spent Nuclear Fuel and Storage Containers	S&M,PB	EU	Technology Needed to Detect Corrosion of SNF and Storage Containers.
ID-S.1.12	Understanding the Behavior of Waste Forms and Their Near-field Transport	PB	EU	Need to Improve Conceptual Models to More Accurately Estimate Releases From Contaminant Waste Forms.
ods-int-gjpo-1.2	Long-life Signage	S&M,PB	EU	Need For Improved, More Durable Signs That Are More Resistant to Weather and Vandalism.
ods-int-gjpo-1.3	Ways to Strengthen Physical Or Institutional Controls	PB	EU	Need For Improved Physical Barriers and Intrusion Prevention Systems.
ods-memo-id-1.4	Engineering Solutions For Permanent Control of Residual Contamination and Waste Left In Place	PB,CC	EU,F	Need For a Better Understanding of Long-term Performance of Engineered Solutions.
ods-memo-oh-1.7	Disposal Facility Physical Change Monitoring System	S&M,PB	EU,F	Need to Develop Technology to Measure Physical Changes and Differential Subsidence In Disposal Facilities.
ods-memo-oh-1.8	Detection of Penetrations In Disposal Facilities	S&M,PB	EU,F	Need to Develop Automated Method to Detect Penetrations Or Intrusions of Water/moisture Or Groundwater Into Disposal Facilities.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosysem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**03-Aug-00**

**Appendix A, Attachment G**



# Physical Barriers

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-rep-3.4	Methods to Validate Containment and Stabilization	PB	EU,F	A Need For Methods to Validate Containment and Stabilization Systems to Ensure Long-term Protection.
ods-rep-4.3	Better Analysis and Assessment Stages For Repository Sites	PB	EU	Need For An Improved Repository Design That Creates No Undue Future Risks.
ods-rep-8-tn-1.1	Enhanced Reliability of Engineered Controls	PB	EU,F	Need For Improved Ability to Predict and Assess Long-term Performance of Engineered Controls (Isolation Caps and Trenches, Reactive Barriers, Etc) and Monitoring Systems.
ods-rep-emsp-1.2	Sensors to Monitor Physical Integrity of Barriers, Structures and Landfills	S&M,PB	EU,F	Need to Develop Improved Sensors to Monitor Physical Integrity of Barriers, Structures and Landfills Post-closure.
RL-WT017	Long-term Testing of Surface Barrier	PB,CC	EU,F	There Is a Need For Better Understanding of Long-term Performance of Surface Barriers to Reduce Moisture Infiltration and Plant and Animal Intrusion.
SR00-1030	Model Degradation In Cement Based Wasteform (e.g., Saltstone) and Concrete Vault Degradation and Collapse	PB	EU,F	There Is a Need to Develop a Model to Simulate the Degradation of Saltstone, a Cement-based Wasteform, and the Concrete Vaults Into Which It Is Emplaced Over Time Periods of Thousands of Years.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment G

## **Attachment H -- Ecosystem Monitoring Needs**

# Ecosystem Monitoring

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
AL-09-01-16-Risk-S	Extrapolation Bias and Uncertainty From Using Biomarkers and Numerical Models to Predict Real Ecological Effects	ECO	S,W	A Better Understanding of the Relationship Between Field Data and Model Assumptions to Quantify the Uncertainty of Model Predictions of Ecological Risk.
ods-rep-emsp-1.3	Remote Sensing of Ecosystems	S&M,ECO	S,W	Need to Develop Improved Remote Sensing of Ecosystem Indicators Including Vegetation.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**03-Aug-00**

**Appendix A, Attachment H**

## **Attachment I -- Toxicity Needs**

# Toxicity

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ID-S.1.16	Quantifying Uncertainty In Risk Calculations	TOX		A Better Understanding of the Health Effects of Mixtures of Contaminants and Quantifying the Uncertainties of Health Effects Will Improve Risk Calculations.
RL-SS39	Understand and Provide Means to Quantify the Impacts of River Contamination On Receptors	TOX		Need to Develop Consistent Ways to Measure Impacts (Human, Ecological, Cultural, Socioeconomic) to Exposed Groups. Information Will Be Used to Determine Toxicity Benchmarks For the Decision-making Process.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment I

## **Attachment J -- Non Science and Technology Needs**

## Non S and T

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
AL-09-01-33-NM	Core Scientific R&D Capability In Support of Nuclear Material Management Needs			Need For Retention of Scientific Expertise (Chemistry and Physics) Related to Safety and Health Issues For Stabilization and Storage of Nuclear Materials.
ods-int-id-1.4	Policy For Determining Level of Security For Access Control			A Policy Is Needed to Determine the Level of Security (Access Control) Required For An Entombed Facility/structure.
ods-int-id-1.5	Uniform DOE Policy For Stakeholder Issues			Need For a National Policy That Addresses Stakeholder Concerns About Entombment/D&D Practices That Apply to All Sites Uniformly.
ods-int-id-5.2	Method to Monitor Impacts of Changes On Modeling Requirements and Toxicity Data			Need Method to Monitor the Impacts of Changes On Modeling Requirements and Toxicity Data.
ods-memo-id-1.3	Methods to Support the Integration of Land Management With LTS			Need to Evaluate the Impact of End-State Decisions On Future Land-use Options.
ods-memo-id-1.5	Strong Cost Estimating Tools For LTS			A Need For Better Tools For Defensible Life-cycle Cost Estimates For LTS.
ods-memo-oh-1.3	Automated Security System			Need to Develop An Automated Security System.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

03-Aug-00

Appendix A, Attachment J

## Non S and T

Need Code	Need Title	Category	Contaminated Site Type	Plain Language
ods-rep-3.2	Improved Interagency Coordination			Need For Improved Interagency Coordination Among 18 Specific Research Programs On Hazardous Chemicals and Heavy Metals Directly Related to EM Science Program and DOE Cleanup.
ods-rep-3.3	Long-term Emphasis of Research Focus			EM Science Program Should Emphasize Four Research Areas: (1) Characterization of Subsurface Contaminants and The Subsurface, (2) Conceptual Modeling, (3) Containment and Stabilization, (4) Monitoring and Validation.
ods-rep-3.6	Research Dealing With Transuranic Contaminants Involving Metals and Radionuclide			Need Specific Research Dealing With Transuranic Contaminants Involving Metals and Radionuclides.
ods-rep-3.7	Integration of Research Community to Broaden Community of Researchers			Need to Integrate Research From Government Agencies With Research Capabilities, National Laboratories, Universities, and Industry.
ods-rep-4.1	Develop Integrated Solution With Regards to Present and Future Technologies			Need to Identify Present and Future Subsurface Technologies, Technology Gaps, and Combining Them For An "Integrated Solution."
RF-SNM18	Core Scientific R&D Capability In Support of NMFA Nuclear Material Management Needs			Need For Retention of Scientific Expertise (Chemistry and Physics) Related to Safety and Health Issues For Stabilization and Storage of Nuclear Materials.

**Legend:** S&M = Surveillance and Monitoring  
CC = Caps and Covers  
SS = Subsurface Science

PB = Physical Barriers  
Eco = Ecosystem Monitoring  
Tox = Toxicity

W = Water  
S = Soil  
F = Facilities  
EU = Engineered Units

**03-Aug-00**

**Appendix A, Attachment J**



## **Attachment K – Complete Set of Screened LTS Needs**

**NEED CODE:**

AL-00-01-04-SC

**NEED TITLE:**

Long-term Monitoring Strategies And Techniques To Evaluate The Design Of Material Disposal Area Engineered Covers

**PLAIN LANGUAGE:**

Improved Methods Of Monitoring The Performance Or Stability Of Engineered Caps Or Covers; Cost Savings Is A Goal.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<div>Waste Form/Physical Barriers</div> <div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>Data Collection/ Transmission</div> <div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>Information Management</div> <div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div>	<div>Environmental Setting</div> <div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div>	<div>Cross Cutting</div> <div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div>
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	X X X				
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

AL-09-01-01-SC-S

NEED TITLE:

Transport Of HE And Metals In Fractured Rock And Surface Alluvial Systems

PLAIN LANGUAGE:

Improved Understanding Of The Movement Of High Explosives (RDX) Components And Metal Contaminants (particularly Barium) Below Ground.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

**NEED CODE:** AL-09-01-03-SC-S

**NEED TITLE:** Succession And Long-term Performance Of Landfill Covers

**PLAIN LANGUAGE:** Effects On The Performance Of Landfill Covers Caused By Plant Succession.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					
		<div> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div>	<div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>

AL-09-01-06-SC-S

## Issue Of Scale In Flow Prediction And Contaminant Remediation In Porous Media

Improved Ability To Predict Flow And Transport Below Ground That Captures The Large And Small Scale Physical Processes That Affect Water Movement.

## SCREENING QUESTIONS

A-133

AL-09-01-07-SC-S

## Integration Of Reactive Chemistry Into Field-scale Transport Models

Improved Predictive Modeling Capabilities That Address Complex Chemical And Flow Processes.

## **SCREENING CATEGORIES**

A-134

NEED CODE:

AL-09-01-08-SC-S

NEED TITLE:

Differences Between Saturated And Unsaturated Systems

PLAIN LANGUAGE:

Contaminants Travel Differently In Wet And Dry Below Ground Environments. There Is A Need To Better Understand The Differences.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

AL-09-01-10-SC-S

## Physics Of Fracture Flow And Transport In The Vadose Zone

Better Understanding Of The Importance Of Cracks In Below Ground Water Movement Will Improve Models.

## **SCREENING CATEGORIES**

A-136



AL-09-01-11-SC-S

## Water Fluxes And Solute Transport In Arid And Semiarid Environments

Better Understanding Of Water Movement Over Time And Area In Arid And Semi-arid Underground Environments, And Water Vapor Exchange At The Ground Surface.

## **SCREENING CATEGORIES**

A-137

NEED CODE: AL-09-01-12-SC-S

NEED TITLE: Groundwater-surface Water Interactions

PLAIN LANGUAGE: Better Understanding Of The Interaction Between Groundwater And Surface Water, I.e., What Affect Does Groundwater Pumping Have On Streamflow, And What Affect Does Surface Water Diversion Have On Groundwater Recharge.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

AL-09-01-15-SC-S

## Separation Of Metals And Radionuclides From Uncontaminated Soils; Transport Of Metals And Radionuclides In Sediments And Surface Alluvial Systems

## Better Understanding Of The Separation And Movement Of Metals And Radionuclides From Soils And Sediment.

### SCREENING CATEGORIES

SCREENING QUESTIONS									
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div> <div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>Data Collection/Transmission</div> <div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div>	<div>Information Management</div> <div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div>	<div>Environmental Setting</div> <div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div>	<div>Cross Cutting</div> <div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div>			
Relates to final engineered system performance	<input type="checkbox"/>								
Improves data management	<input type="checkbox"/>								
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>								
Involves long term monitoring and surveillance	<input type="checkbox"/>								
Pertains to non S and T	<input type="checkbox"/>								
Better confidence in risk prediction	<input checked="" type="checkbox"/>								
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>								

## NEED CODE:

AL-09-01-16-RISK-S

## NEED TITLE:

Extrapolation Bias And Uncertainty From Using Biomarkers And Numerical Models To Predict Real Ecological Effects

## PLAIN LANGUAGE:

A Better Understanding Of The Relationship Between Field Data And Model Assumptions To Quantify The Uncertainty Of Model Predictions Of Ecological Risk.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

AL-09-01-33-NM

NEED TITLE:

Core Scientific R&d Capability In Support Of Nuclear Material Management Needs

PLAIN LANGUAGE:

Need For Retention Of Scientific Expertise (chemistry And Physics) Related To Safety And Health Issues  
For Stabilization And Storage Of Nuclear Materials.

		SCREENING CATEGORIES				
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: AL-09-02-01-SC

NEED TITLE: Long-term Site Monitoring System

PLAIN LANGUAGE: Improved Site Monitoring And Surveillance System Resulting In Cost Reductions.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Pertains to non S and T	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better confidence in risk prediction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NEED CODE: AL-09-02-02-SC

NEED TITLE: Environmental Restoration (er) Site Hazard Information System

PLAIN LANGUAGE: Need To Develop An Information System To Ensure The Availability And Retrievability Of Site Hazard Information In Real-time For Future Site Activities (including Emergency Response)

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting					
Pertains to site maintenance	<input type="checkbox"/>										
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input checked="" type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input checked="" type="checkbox"/>										

NEED CODE:

CH-SS04-99

NEED TITLE:

Long-term Groundwater Monitoring

PLAIN LANGUAGE:

Need For Enhanced Or New Monitoring Techniques That Allow More Reliable, Quick And Inexpensive Groundwater Analysis.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input checked="" type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					



NEED CODE:

ID-1.1.05

NEED TITLE:

Detect Interactions Between Spent Nuclear Fuel And Storage Containers

PLAIN LANGUAGE:

Technology Needed To Detect Corrosion Of SNF And Storage Containers.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

id-6.1.02

NEED TITLE:

Real-time Field Instrumentation For Characterization And Monitoring Soils And Groundwater.

PLAIN LANGUAGE:

Rapid And Accurate Instrumentation Needed To Identify Groundwater And Soil Contamination, Concentrations To Compare With Risk-based Levels.

		<b>SCREENING CATEGORIES</b>				
<b>SCREENING QUESTIONS</b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

id-6.1.27

NEED TITLE:

Integrated Suite Of In Situ Instruments To Determine Flux In The Vadose Zone.

PLAIN LANGUAGE:

Integrated Tools And Devices Are Needed To Directly Measure Contaminant Flux As Key Modeling Input To Improve Predictions.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>														
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>		
Relates to final engineered system performance	<input checked="" type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		
Improves data management	<input type="checkbox"/>															
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>															
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>															
Pertains to non S and T	<input type="checkbox"/>															
Better confidence in risk prediction	<input checked="" type="checkbox"/>															
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>															
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

**NEED TITLE:** Instrumentation To Reliably Measure Soil Gas Flux Accounting For Barometric And Temporal Variations.

SCREENING QUESTIONS		SCREENING CATEGORIES									
Pertains to site maintenance	<input type="checkbox"/>	Waste Form/Physical Barriers		Data Collection/Transmission		Information Management		Environmental Setting		Cross Cutting	
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

**NEED TITLE:** Improved Passive Vapor Extraction Technology.

**PLAIN LANGUAGE:** Better Understanding Of Natural Changes In Temperature And Pressure That Affect Soil Gas Movement To Depths Of 600 Feet Vs. The Current Capability Of 20 Feet.

## **SCREENING QUESTIONS**

**Pertains to site maintenance**

**Relates to final engineered system performance**

### Improves data management

**Contributes to better understanding of fate and transport**

**Involves long term monitoring and surveillance**

**Pertains to non S and T**

### Better confidence in risk prediction

**Enhances ability to respond to failure in final configuration**

[illegible]

NEED CODE:

id-S.1.01

NEED TITLE:

Microbial Alteration Of Heavy Metal And Radionuclide Partitioning At Mineral Surfaces

PLAIN LANGUAGE:

Need To Study Biological Processes That Affect Mobility And Partitioning Of Heavy Metals And Rad Contaminants.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: id-S.1.04

NEED TITLE: Real-time Field Instrumentation For Characterization And Monitoring Soils And Groundwater.

PLAIN LANGUAGE: Need Is For Faster And Cheaper Detection Devices To Aid In Soil And Groundwater Characterization, Sampling And Monitoring Of Contaminants Below Ground.

		SCREENING CATEGORIES				
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input checked="" type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

id-S.1.09

NEED TITLE:

Characterization Of Scale And Spatial Heterogeneity And Preferential Flow

PLAIN LANGUAGE:

Need To Improve The Ability To Predict Flow And Transport Modeling Of Contamination Below Ground. This Deals With The Uneven Distribution Of Contaminant Pathways And Our Ability To Predict Preferential Flow.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					



ID-S.1.10

## Geochemistry Of Contaminants In The Vadose Zone

Need For Better Understanding Of Interaction Between Geology And Contaminants Below Ground. Will Improve Movement Predictions.

## SCREENING CATEGORIES

A-153

**NEED CODE:** ID-S.1.11

**NEED TITLE:** Modeling Of Flow And Transport In The Vadose Zone

**PLAIN LANGUAGE:** Improve Modeling For Contaminant Movement Below Ground.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>										
Involves long term monitoring and surveillance	<input type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										
		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

NEED CODE:

ID-S.1.12

NEED TITLE:

Understanding The Behavior Of Waste Forms And Their Near-field Transport

PLAIN LANGUAGE:

Need To Improved Conceptual Models To More Accurately Estimate Releases From Contaminant Waste Forms.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/> </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div> <div> <input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/> </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

ID-S.1.14

## Transport Of Contaminants In The Vapor Phase

## Better Understanding And Characterization Of How Contaminants Move In The Soil Gas Phase Below Ground.

## **SCREENING CATEGORIES**

A-156

ID-S.1.15

## Physics Of Flow In The Vadose Zone

Need To Conduct Research To Improve Our Ability To Quantify And Predict Contaminant Transport In Below Ground.

### SCREENING CATEGORIES

A-157

NEED CODE:

ID-S.1.16

NEED TITLE:

Quantifying Uncertainty In Risk Calculations

PLAIN LANGUAGE:

A Better Understanding Of The Health Effects Of Mixtures Of Contaminants And Quantifying The Uncertainties Of Health Effects Will Improve Risk Calculations.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

**NEED TITLE:** Development Of Sensors For Large Scale Measurements In The Vadose Zone To Define Spatial Variability.

SCREENING QUESTIONS		SCREENING CATEGORIES									
Pertains to site maintenance	<input type="checkbox"/>	Waste Form/Physical Barriers		Data Collection/Transmission		Information Management		Environmental Setting		Cross Cutting	
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

ID-S.1.18

## Development Of Indirect Sensing Instrumentation For Spatial Variability Analyses Of State Variables

## A Method Is Needed To Obtain A Cost-effective Technique To Map Moisture Content, Pressure And Contaminant Concentration Between Boreholes Below Ground.

## SCREENING CATEGORIES

A-160



ID-S.1.19

## In Situ Biologic Activity Sensor For Vadose Zone And Groundwater Monitoring, Characterization And Remediation.

Need To Develop Devices And Instruments To Measure Biological Activity Far Below Ground. Indicates Contaminant Decay To Predict Concentrations At Sites.

### **SCREENING CATEGORIES**

<b><u>SCREENING QUESTIONS</u></b>					
Pertains to site maintenance	<input type="checkbox"/>				
Relates to final engineered system performance	<input type="checkbox"/>				
Improves data management	<input type="checkbox"/>				
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility
Pertains to non S and T	<input type="checkbox"/>				Cross Cutting
Better confidence in risk prediction	<input checked="" type="checkbox"/>				
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>				

**NEED TITLE:** Down Hole Real Time Monitoring Of Radiation(mainly Tritium) In Boreholes

**PLAIN LANGUAGE:** An Instrument Is Needed To Perform Daily Low-level Radiation Measurements In Deep Monitoring Wells. Other Needed Measurements Are Temperature, PH, Electrical Conductivity, Water Level, And Total Gamma.

## **SCREENING QUESTIONS**

### SCREENING CATEGORIES

<b><u>SCREENING QUESTIONS</u></b>					
Pertains to site maintenance	<input type="checkbox"/>				
Relates to final engineered system performance	<input type="checkbox"/>				
Improves data management	<input type="checkbox"/>				
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>		X X X X X X		
Pertains to non S and T	<input type="checkbox"/>				
Better confidence in risk prediction	<input checked="" type="checkbox"/>				
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>				

**PLAIN LANGUAGE:** A Cost-effective Well Design And Sampling Technology Is Needed For Sampling Groundwater For Radionuclides And Other Physical And Chemical Parameters In Deep (up To 1,500 Meters) Wells In Remote Areas.

## SCREENING CATEGORIES

SCREENING QUESTIONS									
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div> <div>           Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility         </div>	<div>Data Collection/Transmission</div> <div>           Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility         </div>	<div>Information Management</div> <div>           Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility         </div>	<div>Environmental Setting</div> <div>           Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility         </div>	<div>Cross Cutting</div> <div>           Long Term Monitoring Risk Water Soil Engineered Units Facility         </div>			
Relates to final engineered system performance	<input type="checkbox"/>								
Improves data management	<input type="checkbox"/>								
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>								
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>								
Pertains to non S and T	<input type="checkbox"/>								
Better confidence in risk prediction	<input checked="" type="checkbox"/>								
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>								

NEED CODE: nv11-0001-08

NEED TITLE: Long Term Management Of Void Space, Containers, And Cover Subsidence Disposed Waste

PLAIN LANGUAGE: Methods Need To Be Developed To Better Predict The Dynamics Of Collapse Of Void Space, Container/waste Form Degradation, And Subsidence Of Cap Materials.

		SCREENING CATEGORIES				
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Durability	Sensor/Device	Data Analysis	Contaminant Modeling	Long Term Monitoring
Maintainability	Durability	Data Interpretation	Fate & Transport	Risk
Monitoring	Maintainability	Reporting	Toxicity	Water
Predictability	Calibration	Accessibility	Ecological Indicators	Soil
Inspection Freq.	Inspection Freq.	Retention	Uncertainty Analysis	Engineered Units
Inspection Cost	Inspection Cost	Records Mgmt	Subsurface Issues	Facility
Water	Water	Cost of Records Mgmt	Model Validation	
Soil	Soil	Water	System Performance Validation	
Engineered Units	Engineered Units	Soil	Water	
Facility	Facility	Engineered Units	Soil	
		Facility	Engineered Units	

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**NEED TITLE:** Long Term, Flexible Arid Site Closure Cover

SCREENING QUESTIONS		SCREENING CATEGORIES									
Pertains to site maintenance	<input type="checkbox"/>	Waste Form/Physical Barriers		Data Collection/Transmission		Information Management		Environmental Setting		Cross Cutting	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility					
Improves data management	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

NEED CODE: nv18-0001-07S

NEED TITLE: Optimizing Monitoring Of Contaminant Transport And Subsidence In The Vadose Zone Of Low Level Radioactive Waste Sites

PLAIN LANGUAGE: Need To Develop Systems That Can Verify Site Conditions And Provide An Early Warning Of The Rate Of Transport Of Waste Contaminants Along Transport Pathways.

		SCREENING CATEGORIES				
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: ods-int-gjpo-1.1

NEED TITLE: Noxious Weed Control

PLAIN LANGUAGE: Need To Develop More Cost Effective, Long Term Noxious Weed Control Methods.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input checked="" type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					





**NEED CODE:** ods-int-gjpo-1.3

**NEED TITLE:** Ways To Strengthen Physical Or Institutional Controls

**PLAIN LANGUAGE:** Need For Improved Physical Barriers And Intrusion Prevention Systems.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>														
Pertains to site maintenance	<input checked="" type="checkbox"/>	Waste Form/Physical Barriers			Data Collection/ Transmission			Information Management			Environmental Setting			Cross Cutting		
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility			Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility			Long Term Monitoring Risk Water Soil Engineered Units Facility		
Improves data management	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>			<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
Contributes to better understanding of fate and transport	<input type="checkbox"/>															
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>															
Pertains to non S and T	<input type="checkbox"/>															
Better confidence in risk prediction	<input checked="" type="checkbox"/>															
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>															

NEED CODE: ods-int-gjpo-1.4

NEED TITLE: Down-hole Monitors

PLAIN LANGUAGE: Need To Develop An In-situ Monitoring Device That Can Anaylze And Transmit The Data Remotely.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>															
Pertains to site maintenance	<input checked="" type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>				<div>Information Management</div>			<div>Environmental Setting</div>				<div>Cross Cutting</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>			<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>				<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div>			<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div>				<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div>	
Improves data management	<input type="checkbox"/>																
Contributes to better understanding of fate and transport	<input type="checkbox"/>																
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<div></div>			<div>X X X X X X X</div>				<div></div>			<div></div>				<div></div>	
Pertains to non S and T	<input type="checkbox"/>	<div></div>			<div></div>				<div></div>			<div>X X X</div>				<div></div>	
Better confidence in risk prediction	<input checked="" type="checkbox"/>																
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>	<div></div>			<div></div>				<div></div>			<div></div>				<div></div>	

NEED CODE: ods-int-gjpo-1.5

NEED TITLE: Ways To Measure Moisture Flows In Caps

PLAIN LANGUAGE: Need To Develop A More Cost Effective, Remotely Operated Device To Measure Moisture In/under Caps And Covers.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input checked="" type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										
		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

**NEED CODE:** ods-int-id-1.3

**NEED TITLE:** Capability To Monitor Contaminant Movement Within Structures

**PLAIN LANGUAGE:** There Is The Need For The Capability To Monitor Structures, Both Internally And Externally, To Ensure Migration Of Contaminants Is Not Occurring And/or To Provide Early Detection.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	Waste Form/Physical Barriers			Data Collection/ Transmission			Information Management			Environmental Setting			Cross Cutting	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div> <div><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/></div>			<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/></div>			<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	
Improves data management	<input type="checkbox"/>														
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input checked="" type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														

**NEED CODE:** ods-int-id-1.4

**NEED TITLE:** Policy For Determining Level Of Security For Access Control

**PLAIN LANGUAGE:** A Policy Is Needed To Determine The Level Of Security (access Control) Required For An Entombed Facility/structure.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

**NEED CODE:** ods-int-id-1.5

**NEED TITLE:** Uniform DOE Policy For Stakeholder Issues

**PLAIN LANGUAGE:** Need For A National Policy That Addresses Stakeholder Concerns About Entombment/d&d Practices That Apply To All Sites Uniformly.

		<u><b>SCREENING CATEGORIES</b></u>				
<u><b>SCREENING QUESTIONS</b></u>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: ods-int-id-10.3

NEED TITLE: Real Time Detection Of Below Ground Releases

PLAIN LANGUAGE: Need To Develop A Real Time Sensor Device To Detect Below Ground Leaks, Spills, Or Releases Of Contaminants Before Reaching Ground/surface Water.

		<u>SCREENING CATEGORIES</u>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers			Data Collection/ Transmission			Information Management			Environmental Setting			Cross Cutting																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Pertains to site maintenance	<input checked="" type="checkbox"/>	Durability	Maintainability	Monitoring	Predictability	Inspection Freq.	Inspection Cost	Water	Soil	Engineered Units	Facility	Sensor/Device	Durability	Maintainability	Calibration	Inspection Freq.	Inspection Cost	Water	Soil	Engineered Units	Facility	Data Analysis	Data Interpretation	Reporting	Accessibility	Retention	Records Mgmt	Cost of Records Mgmt	Water	Soil	Engineered Units	Facility	Contaminant Modeling	Fate & Transport	Toxicity	Ecological Indicators	Uncertainty Analysis	Subsurface Issues	Model Validation	System Performance Validation	Water	Soil	Engineered Units	Facility	Long Term Monitoring	Risk	Water	Soil	Engineered Units	Facility																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Relates to final engineered system performance	<input checked="" type="checkbox"/>	X	X	X	X				X	X	X	X	X	X	X				X	X	X	X																X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

NEED CODE: ods-int-id-10.4

NEED TITLE: Embedded Monitoring Devices Or Sensors

PLAIN LANGUAGE: Need To Develop An Embedded Device To Detect Contamination Releases In High Level Waste Tanks And Storage Structures That Have Been Remediated.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<div>X</div>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<div>X</div>														
Improves data management	<div></div>														
Contributes to better understanding of fate and transport	<div></div>														
Involves long term monitoring and surveillance	<div>X</div>	<div>X X X X X X X X X X</div>			<div>X X X X X X X X X X</div>			<div></div>			<div></div>			<div></div>	
Pertains to non S and T	<div></div>														
Better confidence in risk prediction	<div>X</div>														
Enhances ability to respond to failure in final configuration	<div>X</div>														



NEED CODE: ods-int-id-2.1

NEED TITLE: Better Surveying And Monitoring Devices

PLAIN LANGUAGE: A Need For Improved Contaminant Monitoring Below A Facility Left In Place And A Method To Detect Possible Subsidence Of Capped Engineered Units.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Pertains to non S and T	<input type="checkbox"/>	X X X X X X X X	X X X X X X X X			
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

**NEED CODE:** ods-int-id-2.2

**NEED TITLE:** More Durable Sensors To Monitor Contaminant Movement

**PLAIN LANGUAGE:** A Need To Develop More Durable Sensors To Monitor Contaminant Movement Below Structures.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>										
Involves long term monitoring and surveillance	<input type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										
		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NEED CODE:

ods-int-id-3.1

NEED TITLE:

In-situ Samplers To Detect Contaminant Movement

PLAIN LANGUAGE:

A Need For In-situ Samplers That Can Detect And Send Data Remotely, With Little/no Human Intervention.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

**NEED CODE:** ods-int-id-4.1

**NEED TITLE:** Long-term Information And Records Management System

**PLAIN LANGUAGE:** Need For Long-term Records Management System.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting					
Pertains to site maintenance	<input type="checkbox"/>										
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input checked="" type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

**NEED CODE:** ods-int-id-5.2

**NEED TITLE:** Method To Monitor Impacts Of Changes On Modeling Requirements And Toxicity Data

**PLAIN LANGUAGE:** Need Method To Monitor The Impacts Of Changes On Modeling Requirements And Toxicity Data.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

ods-int-id-6.1

## Sensor Array In SDA To Detect Moisture Infiltration

Need To Develop A Sensor Array In The Soil Cover Over The Subsurface Disposal Area To Detect Moisture Infiltration.

## **SCREENING CATEGORIES**

A-182

ods-int-id-6.2

## Reliable Monitoring Network For Groundwater

### Need To Develop A Reliable Monitoring Network For Groundwater.

## SCREENING CATEGORIES

A-183

**NEED CODE:** ods-int-id-6.3

**NEED TITLE:** Leachate Detection And Collection As A Backup System

**PLAIN LANGUAGE:** Need To Develop A Leachate Detection/collection Backup System In-situ.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/>&lt;</div>													



**NEED CODE:** ods-int-id-6.4

**NEED TITLE:** Improved Closure Cap Cover Design And Monitoring System

**PLAIN LANGUAGE:** Need To Design A Closure Cap/cover And Monitoring System To Maintain Integrity Over The Long Term.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	Waste Form/Physical Barriers			Data Collection/ Transmission			Information Management			Environmental Setting			Cross Cutting	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility			Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility			Long Term Monitoring Risk Water Soil Engineered Units Facility	
Improves data management	<input type="checkbox"/>														
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														

ods-int-id-7.1

### Need To Monitor Groundwater, Ecological Indicators

Need To Monitor Groundwater, Ecological Receptors, Soil And Air (rad) Monitoring, Cap Integrity And Moisture, Plant And Animal Intrusion Into Caps.

## SCREENING CATEGORIES

A-186

ods-int-id-7.2

### Need To Determine Cap Durability

Need To Improve Cap Durability And A Better Understanding Of Contaminant Retention Rates, Dispersivity, Plant Uptake Factors, Bio-accumulation Rates, Fracture Flow Rates, And Boundary Conditions.

## SCREENING CATEGORIES

A-187

**NEED CODE:** ods-int-id-7.3

**NEED TITLE:** Better/cheaper Methods Of Collecting And Analyzing Samples

**PLAIN LANGUAGE:** A Need For Real-time Monitoring And Alarms, (e.g., Inline Sensors For Nitrate At INTEC Effluent), Down-hole Sensors, And Real-time Monitoring For Air Contaminants. Need For Sensors To Measure Water Level In Wells (real Time). For Tritium, There Is A Nee

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

**NEED CODE:** ods-int-id-7.4

**NEED TITLE:** Groundwater Monitoring Using Electronic Data Transmission

**PLAIN LANGUAGE:** Need To Capture Groundwater Data, Unexploded Ordnance Locations, And General Records, And Official Records (including Log Books) In Perpetuity. Need For Comprehensive Site-wide Data Storage System.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input checked="" type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: ods-int-id-7.5

NEED TITLE: Ecological Monitoring, Data Management

PLAIN LANGUAGE: Need For Improved Ecological Monitoring Capabilities To Detect Subtle Changes In Ecological Indicators.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: ods-int-id-7.6

NEED TITLE: Improved Well Integrity And Closure

PLAIN LANGUAGE: Need For Improved Well Designs To Enhance Long Term Well Durability And Maintainability.

SCREENING CATEGORIES											
SCREENING QUESTIONS		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input checked="" type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

**NEED CODE:** ods-int-id-8.1

**NEED TITLE:** Sensors That Can Be Inserted Into Grout

**PLAIN LANGUAGE:** Need To Develop In-situ Grout Integrity Sensors.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>		<div>Data Collection/ Transmission</div>		<div>Information Management</div>		<div>Environmental Setting</div>		<div>Cross Cutting</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Improves data management	<input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										



NEED CODE: ods-int-id-8.2

NEED TITLE: Ways To Quantify Moisture In/under Caps

PLAIN LANGUAGE: Need To Develop Capability To Quantify Moisture In And Under Covers/caps.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility			Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility			Long Term Monitoring Risk Water Soil Engineered Units Facility	
Improves data management	<input type="checkbox"/>	<div><div>X</div><div>X</div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div>X</div></div>			<div><div>X</div><div></div><div></div><div>X</div><div></div><div></div><div></div><div></div><div></div><div>X</div></div>			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>			<div><div></div><div></div><div></div><div></div><div></div><div></div><div>X</div><div></div><div></div><div>X</div></div>	
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<div><div>X</div><div>X</div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div>X</div></div>			<div><div>X</div><div></div><div></div><div>X</div><div></div><div></div><div></div><div></div><div></div><div>X</div></div>			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>			<div><div></div><div></div><div></div><div></div><div></div><div></div><div>X</div><div></div><div></div><div>X</div></div>			<div><div>X</div><div></div><div></div><div></div><div></div><div></div><div>X</div><div></div><div></div><div>X</div></div>	
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input checked="" type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														

NEED CODE: ods-int-id-8.3

NEED TITLE: Probes For Isotopic Measurement

PLAIN LANGUAGE: Need A Device To Measure Radio-isotopes In-situ.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: ods-int-ws-1.1

NEED TITLE: Embedded Radon Sensor

PLAIN LANGUAGE: Need For A Below Ground Monitor/sensor Device To Detect Radon At The Top Of The Radon Barrier Instead Of At The Surface Of The Cap.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

ods-memo-id-1.1

## Cost Effective Methods For LTS Monitoring And Surveillance

The Need To Evaluate The Use Of In-situ Analytical Techniques Or Remote Monitoring To Replace Current Techniques Of Sampling And Analysis To Reduce Costs.

### SCREENING CATEGORIES

A-196

**NEED CODE:** ods-memo-id-1.2

**NEED TITLE:** Reliable Risk Assessment Methodology And Fate And Transport Modeling To Support LTS

**PLAIN LANGUAGE:** A Need To Reduce The Uncertainty In Risk Predictions To Decrease The Cost Of Stewardship Activities.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

ods-memo-id-1.3

## Methods To Support The Integration Of Land Management With LTS

Need To Evaluate The Impact Of End-state Decisions On Future Land-use Options.

## **SCREENING CATEGORIES**

A-198

ods-memo-id-1.4

## Engineering Solutions For Permanent Control Of Residual Contamination And Waste Left In Place

## Need For A Better Understanding Of Long-term Performance Of Engineered Solutions.

## SCREENING CATEGORIES

A-199

NEED CODE: ods-memo-id-1.5

NEED TITLE: Strong Cost Estimating Tools For LTS

PLAIN LANGUAGE: A Need For Better Tools For Defensible Life-cycle Cost Estimates For LTS.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					



**NEED CODE:** ods-memo-id-1.6

**NEED TITLE:** Tools For The Management For Information Of Future Generations

**PLAIN LANGUAGE:** Need To Develop Tools To Ensure Information Management And Transfer To Future Generations.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting					
Pertains to site maintenance	<input type="checkbox"/>										
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input checked="" type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

NEED CODE: ods-memo-oh-1.1

NEED TITLE: Long Term Record Keeping And Retrievalability

PLAIN LANGUAGE: Need To Develop A Record Keeping System That Is Easily Accessed And Maintained.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting					
Pertains to site maintenance	<input checked="" type="checkbox"/>										
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input checked="" type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										
		Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility					

NEED CODE:

ods-memo-oh-1.10

NEED TITLE:

Remote Sensing And Monitoring Of Vegetation

PLAIN LANGUAGE:

Need To Develop Remote Sensing Technology To Monitor Long Term Health Of Vegetation On Disposal Facility Covers And Ecosystem.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
Pertains to site maintenance	<div>X</div>	<div>Waste Form/Physical Barriers</div> <div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div>X X X     </div>									

**NEED CODE:** ods-memo-oh-1.11

**NEED TITLE:** Integrated Real Time Sensor And Data Transmission System

**PLAIN LANGUAGE:** Need To Develop Integrated System To Collect, Store And Transmit Data In Real Time.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	
Improves data management	<input checked="" type="checkbox"/>														
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

NEED CODE:

ods-memo-oh-1.12

NEED TITLE:

Automated X-ray System To Examine Disposal Cell

PLAIN LANGUAGE:

Need To Develop Automated System To Examine Contents Of Disposal Cell Post Closure.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>															
Pertains to site maintenance	<div>X</div>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>				<div>Information Management</div>			<div>Environmental Setting</div>				<div>Cross Cutting</div>	
Relates to final engineered system performance	<div>X</div>																
Improves data management	<div></div>																
Contributes to better understanding of fate and transport	<div></div>																
Involves long term monitoring and surveillance	<div>X</div>	<div><div></div><div>X</div><div>X</div><div>X</div><div></div><div></div><div>X</div></div>			<div><div>X</div><div>X</div><div>X</div><div>X</div><div>X</div><div>X</div><div></div><div></div><div>X</div></div>				<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>			<div><div></div><div></div><div></div><div>X</div><div>X</div><div></div><div></div><div>X</div></div>				<div><div>X</div><div></div><div></div><div></div><div>X</div></div>	
Pertains to non S and T	<div></div>																
Better confidence in risk prediction	<div></div>																
Enhances ability to respond to failure in final configuration	<div>X</div>																

**NEED CODE:** ods-memo-oh-1.13

**NEED TITLE:** Real-time Leachate Detection And Measurement System

**PLAIN LANGUAGE:** Need To Develop A Real-time, Monitoring And Sensing System To Determine The Integrity Of Leachate Collection Systems And Detect Leaks In Collection System Lines.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>															
Pertains to site maintenance	<div>X</div>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>				<div>Information Management</div>			<div>Environmental Setting</div>				<div>Cross Cutting</div>	
Relates to final engineered system performance	<div>X</div>																
Improves data management	<div></div>																
Contributes to better understanding of fate and transport	<div></div>																
Involves long term monitoring and surveillance	<div>X</div>	<div><div></div><div>X</div><div>X</div><div>X</div><div>X</div><div>X</div><div></div></div>			<div><div>X</div><div>X</div><div>X</div><div>X</div><div>X</div><div>X</div><div>X</div><div>X</div><div></div></div>				<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>			<div><div></div><div></div><div></div><div></div><div>X</div><div>X</div><div>X</div><div>X</div><div></div></div>				<div><div>X</div><div></div><div>X</div><div></div><div>X</div></div>	
Pertains to non S and T	<div></div>																
Better confidence in risk prediction	<div></div>																
Enhances ability to respond to failure in final configuration	<div>X</div>																

NEED CODE: ods-memo-oh-1.14

NEED TITLE: Passive Treatment Of Leachate

PLAIN LANGUAGE: Need To Develop A Process For The Passive Treatment Of Leachate.

		SCREENING CATEGORIES				
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input checked="" type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/></div>	<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/></div>	<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input checked="" type="checkbox"/>					

**NEED CODE:** ods-memo-oh-1.2

**NEED TITLE:** Leachate Collection And Transmission Line Maintenance

**PLAIN LANGUAGE:** Need To Develop Automated Technology To Unplug Leachate Collection And Transmission Lines.

		<u><b>SCREENING CATEGORIES</b></u>				
<u><b>SCREENING QUESTIONS</b></u>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input checked="" type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>	<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>	<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div>	<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div>	<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					



NEED CODE: ods-memo-oh-1.3

NEED TITLE: Automated Security System

PLAIN LANGUAGE: Need To Develop An Automated Security System.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

ods-memo-oh-1.4

## Perimeter Groundwater Well Monitoring

Need To Develop Automated Technology To Monitor Perimeter Groundwater Wells To Determine Elevation Of Water, Detect Contaminants, Etc.

### SCREENING CATEGORIES

A-210

NEED CODE: ods-memo-oh-1.5

NEED TITLE: Monitoring Biological/chemical Properties Of Ponds And Streams (Paddy's run)

PLAIN LANGUAGE: Need To Develop Automated Method For Monitoring Biological And Chemical Properties Of Ponds And Streams (Paddy's Run)

SCREENING CATEGORIES									
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting			
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div> <div><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div> <div><input checked="" type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			
Relates to final engineered system performance	<input type="checkbox"/>								
Improves data management	<input type="checkbox"/>								
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>								
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>								
Pertains to non S and T	<input type="checkbox"/>								
Better confidence in risk prediction	<input checked="" type="checkbox"/>								
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>								

NEED CODE: ods-memo-oh-1.6

NEED TITLE: Automated Meteorological Monitoring Stations

PLAIN LANGUAGE: Need To Construct Real Time Automated Meteorological Monitoring Stations.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<input type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>			<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>			<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div>			<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div>			<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div>	
Improves data management	<input type="checkbox"/>														
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input checked="" type="checkbox"/>	<div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>				
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														

**NEED CODE:** ods-memo-oh-1.7

**NEED TITLE:** Disposal Facility Physical Change Monitoring System

**PLAIN LANGUAGE:** Need To Develop Technology To Measure Physical Changes And Differential Subsidence In Disposal Facilities.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>														
Pertains to site maintenance	<input checked="" type="checkbox"/>	Waste Form/Physical Barriers			Data Collection/ Transmission			Information Management			Environmental Setting			Cross Cutting		
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility			Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility			Long Term Monitoring Risk Water Soil Engineered Units Facility		
Improves data management	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Contributes to better understanding of fate and transport	<input type="checkbox"/>															
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>															
Pertains to non S and T	<input type="checkbox"/>															
Better confidence in risk prediction	<input type="checkbox"/>															
Enhances ability to respond to failure in final configuration	<input checked="" type="checkbox"/>															

NEED CODE:

ods-memo-oh-1.8

NEED TITLE:

Detection Of Penetrations In Disposal Facilities

PLAIN LANGUAGE:

Need To Develop Automated Method To Detect Penetrations Or Intrusions Of Water/moisture Or Groundwater Into Disposal Facilities.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>																	
Pertains to site maintenance	<div>X</div>	Waste Form/Physical Barriers			Data Collection/ Transmission				Information Management			Environmental Setting			Cross Cutting				
Relates to final engineered system performance	<div>X</div>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility				Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility			Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility			Long Term Monitoring Risk Water Soil Engineered Units Facility				
Improves data management	<div></div>	<div>X</div> <div>X</div>	<div>X</div> <div>X</div>	<div>X</div> <div>X</div>	<div></div> <div></div>	<div>X</div> <div></div>	<div></div> <div></div>	<div>X</div> <div></div>	<div></div> <div></div>	<div></div> <div></div>	<div></div> <div></div>	<div></div> <div></div>	<div></div> <div></div>	<div></div> <div></div>	<div></div> <div></div>	<div></div> <div></div>	<div>X</div> <div></div>	<div></div> <div></div>	<div>X</div> <div></div>
Contributes to better understanding of fate and transport	<div></div>																		
Involves long term monitoring and surveillance	<div>X</div>	<div></div>	<div>X</div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>
Pertains to non S and T	<div></div>																		
Better confidence in risk prediction	<div></div>																		
Enhances ability to respond to failure in final configuration	<div>X</div>																		

NEED CODE: ods-memo-oh-1.9

NEED TITLE: Detection Of Erosion And Runoff

PLAIN LANGUAGE: Need To Develop Automated Technology To Detect, Measure And Monitor Erosion And Runoff From Remediated Areas And Disposal Facilities.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Pertains to site maintenance	<div>X</div>	Waste Form/Physical Barriers				Data Collection/ Transmission				Information Management				Environmental Setting				Cross Cutting																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Relates to final engineered system performance	<div>X</div>	Durability	Maintainability	Monitoring	Predictability	Inspection Freq.	Inspection Cost	Water	Soil	Engineered Units	Facility	Sensor/Device	Durability	Maintainability	Calibration	Inspection Freq.	Inspection Cost	Water	Soil	Engineered Units	Facility	Data Analysis	Data Interpretation	Reporting	Accessibility	Retention	Records Mgmt	Cost of Records Mgmt	Water	Soil	Engineered Units	Facility	Contaminant Modeling	Fate & Transport	Toxicity	Ecological Indicators	Uncertainty Analysis	Subsurface Issues	Model Validation	System Performance Validation	Water	Soil	Engineered Units	Facility	Long Term Monitoring	Risk	Water	Soil	Engineered Units	Facility																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Improves data management	<div></div>	X	X	X				X		X		X	X	X	X	X	X	X		X																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

**NEED CODE:** ods-rep-2

**NEED TITLE:** LTS Data And Information Management Needs From The Working Draft

**PLAIN LANGUAGE:** There Is A Need For LTS Data Standards For Storage And Use.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	
Improves data management	<input checked="" type="checkbox"/>														
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														



NEED CODE: ods-rep-3.1

NEED TITLE: Better Tools For In-situ Field Measurement

PLAIN LANGUAGE: Identifies The Need For Better Tools (e.g. In-situ Field Measurement) To Characterize And Accurately Predict (model) Contamination Movement Below Ground.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>														
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>				<div>Cross Cutting</div>	
Relates to final engineered system performance	<input type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/>&lt;</div>														



**NEED CODE:** ods-rep-3.3

**NEED TITLE:** Long-term Emphasis Of Research Focus

**PLAIN LANGUAGE:** EM Science Program Should Emphasize Four Research Areas: 1) Characterization Of Subsurface Contaminants And The Subsurface, 2) Conceptual Modeling, 3) Containment And Stabilization, 4) Monitoring And Validation.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

ods-rep-3.4

NEED TITLE:

Methods To Validate Containment And Stabilization

PLAIN LANGUAGE:

A Need For Methods To Validate Containment And Stabilization Systems To Ensure Long-term Protection.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/> </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/> </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

ods-rep-3.5

NEED TITLE:

Methods For Designing Monitoring Systems To Detect Current Conditions And Changes

PLAIN LANGUAGE:

Need To Develop Methods For Designing Monitoring Systems To Detect Both Current Conditions And Changes In System.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		<u>Waste Form/Physical Barriers</u>	<u>Data Collection/ Transmission</u>	<u>Information Management</u>	<u>Environmental Setting</u>	<u>Cross Cutting</u>
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

ods-rep-3.6

NEED TITLE:

Research Dealing With Transuranic Contaminants Involving Metals And Radionuclide

PLAIN LANGUAGE:

Need Specific Research Dealing With Transuranic Contaminants Involving Metals And Radionuclides.

		SCREENING CATEGORIES				
<b>SCREENING QUESTIONS</b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improves data management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contributes to better understanding of fate and transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Involves long term monitoring and surveillance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pertains to non S and T	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better confidence in risk prediction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NEED CODE:

ods-rep-3.7

NEED TITLE:

Integration Of Research Community To Broaden Community Of Researchers

PLAIN LANGUAGE:

Need To Integrate Research From Government Agencies With Research Capabilities, National Laboratories, Universities, And Industry.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input checked="" type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

ods-rep-4.1

## Develop Integrated Solution With Regards To Present And Future Technologies

Need To Identify Present And Future Subsurface Technologies, Technology Gaps, And Combining Them For An "integrated Solution".

### **SCREENING CATEGORIES**

A-224



**NEED CODE:** ods-rep-4.2

**NEED TITLE:** Full Capabilities Of Vadose Zone Characterization, Prediction, And Monitoring

**PLAIN LANGUAGE:** A Better Understanding Of Below Ground Characterization, Prediction, And Monitoring.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>														
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>				<div>Cross Cutting</div>	
Relates to final engineered system performance	<input type="checkbox"/>															
Improves data management	<input type="checkbox"/>															
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility			Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility				Long Term Monitoring Risk Water Soil Engineered Units Facility	
Involves long term monitoring and surveillance	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>				<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Pertains to non S and T	<input type="checkbox"/>															
Better confidence in risk prediction	<input checked="" type="checkbox"/>															
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>															

**NEED CODE:** ods-rep-4.3

**NEED TITLE:** Better Analysis And Assessment Stages For Repository Sites

**PLAIN LANGUAGE:** Need For An Improved Repository Design That Creates No Undue Future Risks.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

**NEED CODE:** ods-rep-4.4

**NEED TITLE:** Validation Data Through Model Adjustments

**PLAIN LANGUAGE:** A Need For Site Characterization Data To Validate Model Predictions.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										
		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

**NEED CODE:** ods-rep-4.5

**NEED TITLE:** Need For Predicting Contaminant Transport Through The Vadose Zone

**PLAIN LANGUAGE:** Need To Predict Contaminant Transport Below Ground Using A Three-step Iterative Process.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>														
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>				<div>Cross Cutting</div>	
Relates to final engineered system performance	<input type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/>&lt;</div>														

**PLAIN LANGUAGE:** Need To Use Field Data Gathered Over Long Periods Of Time To Accurately Predict Contaminant Movement And Behavior.

### SCREENING CATEGORIES

<b><u>SCREENING QUESTIONS</u></b>					
Pertains to site maintenance	<input type="checkbox"/>				
Relates to final engineered system performance	<input type="checkbox"/>				
Improves data management	<input type="checkbox"/>				
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility
Pertains to non S and T	<input type="checkbox"/>				Cross Cutting
Better confidence in risk prediction	<input checked="" type="checkbox"/>				
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>				

**NEED CODE:** ods-rep-4.7

**NEED TITLE:** Ambient Monitoring, Performance Monitoring And Detection Monitoring

**PLAIN LANGUAGE:** A Complete Long Term Monitoring System Includes The Need For Ambient, Performance, And Detection Monitoring.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>		<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										
		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ods-rep-8-nm-1.1

## Cost Effective Monitoring And Surveillance Techniques

Need For Improved, Cost Effective, Monitoring And Surveillance Techniques.

## SCREENING CATEGORIES

A-231

NEED CODE: ods-rep-8-tn-1.1

NEED TITLE: Enhanced Reliability Of Engineered Controls

PLAIN LANGUAGE: Need For Improved Ability To Predict And Assess Long-term Performance Of Engineered Controls (isolation Caps And Trenches, Reactive Barriers, Etc) And Monitoring Systems.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input checked="" type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										
		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>		<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	



**NEED CODE:** ods-rep-8-tn-1.3

**NEED TITLE:** Remote Monitoring Techniques

**PLAIN LANGUAGE:** The Need For Remote Monitoring Of Caps, Covers And Trenches To Detect Failures, Possibly Using Satellite Technology.

SCREENING CATEGORIES										
SCREENING QUESTIONS		Waste Form/Physical Barriers		Data Collection/ Transmission		Information Management		Environmental Setting		Cross Cutting
Pertains to site maintenance	X									
Relates to final engineered system performance	X									
Improves data management										
Contributes to better understanding of fate and transport										
Involves long term monitoring and surveillance	X									
Pertains to non S and T										
Better confidence in risk prediction	X									
Enhances ability to respond to failure in final configuration	X									
		Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility
		X X		X X X X				X X		X

NEED CODE: ods-rep-8-tn-1.5

NEED TITLE: Insitu Biological Monitoring To Replace Analytical Monitoring

PLAIN LANGUAGE: Need For Insitu Biological Monitoring To Supplement And Eventually Replace Traditional Analytical Monitoring.

		SCREENING CATEGORIES				
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>	<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div>	<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div>	<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div>	<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div>
Pertains to non S and T	<input type="checkbox"/>	<div></div>	<div>X X X X X X X</div>	<div></div>	<div></div>	<div>X</div>
Better confidence in risk prediction	<input type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: ods-rep-emsp-1.1

NEED TITLE: Contaminant Monitors And Diagnostic Parameters

PLAIN LANGUAGE: Need To Develop Improved Sensors And Define Diagnostic Parameters To Identify And Characterize The Presence Of Contaminants In All Media.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>									
		Waste Form/Physical Barriers		Data Collection/Transmission		Information Management		Environmental Setting		Cross Cutting	
Pertains to site maintenance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility		Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility		Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility		Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input type="checkbox"/>										
Improves data management	<input type="checkbox"/>										
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>										
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>										
Pertains to non S and T	<input type="checkbox"/>										
Better confidence in risk prediction	<input checked="" type="checkbox"/>										
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>										

NEED CODE:

ods-rep-emsp-1.2

NEED TITLE:

Sensors To Monitor Physical Integrity Of Barriers, Structures And Landfills

PLAIN LANGUAGE:

Need To Develop Improved Sensors To Monitor Physical Integrity Of Barriers, Structures And Landfills Post-closure.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>																			
		Waste Form/Physical Barriers				Data Collection/ Transmission				Information Management				Environmental Setting				Cross Cutting			
Pertains to site maintenance	<input checked="" type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>				<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>				<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>				<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>				<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>			
Relates to final engineered system performance	<input checked="" type="checkbox"/>																				
Improves data management	<input type="checkbox"/>																				
Contributes to better understanding of fate and transport	<input type="checkbox"/>																				
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>																				
Pertains to non S and T	<input type="checkbox"/>																				
Better confidence in risk prediction	<input checked="" type="checkbox"/>																				
Enhances ability to respond to failure in final configuration	<input checked="" type="checkbox"/>																				
		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

NEED CODE: ods-rep-emsp-1.3

NEED TITLE: Remote Sensing Of Ecosystems

PLAIN LANGUAGE: Need To Develop Improved Remote Sensing Of Ecosystem Indicators Including Vegetation.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>											
Pertains to site maintenance	<input checked="" type="checkbox"/>	<div>Waste Form/Physical Barriers</div> <div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>		<div>Data Collection/ Transmission</div> <div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>		<div>Information Management</div> <div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>		<div>Environmental Setting</div> <div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>		<div>Cross Cutting</div> <div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div> <div><input checked="" type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			
Relates to final engineered system performance	<input type="checkbox"/>												
Improves data management	<input type="checkbox"/>												
Contributes to better understanding of fate and transport	<input type="checkbox"/>												
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>												
Pertains to non S and T	<input type="checkbox"/>												
Better confidence in risk prediction	<input type="checkbox"/>												
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>												

NEED CODE:

oh-f048

NEED TITLE:

Long-term Monitoring Of Caps And Covers

PLAIN LANGUAGE:

Need To Identify Improved Long-term Monitoring Of The On-Site Disposal Facility Cover System.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	<div>           Durability            Maintainability            Monitoring            Predictability            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/> </div>	<div>           Sensor/Device            Durability            Maintainability            Calibration            Inspection Freq.            Inspection Cost            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>	<div>           Data Analysis            Data Interpretation            Reporting            Accessibility            Retention            Records Mgmt            Cost of Records Mgmt            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>	<div>           Contaminant Modeling            Fate &amp; Transport            Toxicity            Ecological Indicators            Uncertainty Analysis            Subsurface Issues            Model Validation            System Performance Validation            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>	<div>           Long Term Monitoring            Risk            Water            Soil            Engineered Units            Facility         </div> <div> <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> </div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

oh-f052

## Long-term Treatment And Monitoring Of Leachate

## Need For A Stand-alone System To Detect And Treat Leachate After All Other Operating Systems Are Shut Down.

### **SCREENING CATEGORIES**

<b><u>SCREENING QUESTIONS</u></b>						
Pertains to site maintenance	<input type="checkbox"/>	Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Improves data management	<input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: ORBW-08

NEED TITLE: Long-term Performance Assessments

PLAIN LANGUAGE: Improved Predictive Capabilities For Long-term Performance Assessments Are Needed To Ensure Long-term Reliability.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility			Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility			Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility			Long Term Monitoring Risk Water Soil Engineered Units Facility	
Improves data management	<input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input checked="" type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														



ORHY-06

## Fractured Media Flow Characterization

## Technologies Are Needed To Predict Fracture Networks, Groundwater Flow And Contaminant Transport Below Ground.

### SCREENING CATEGORIES

A-241

NEED CODE:

ORHY-21

NEED TITLE:

Real Time Performance Assessment Monitoring

PLAIN LANGUAGE:

Technologies For Real-time, In Situ Monitoring Of Groundwater And Surface Water.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

ORHY-21A

## Real Time Performance Assessment Monitoring

## Technologies For Real-time, In Situ Monitoring Of Groundwater And Surface Water (Paducah).

### **SCREENING CATEGORIES**

A-243

RF-SNM18

## Core Scientific R&D Capability In Support Of NMFA Nuclear Material Management Needs

Need For Retention Of Scientific Expertise (chemistry And Physics) Related To Safety And Health Issues For Stabilization And Storage Of Nuclear Materials.

## SCREENING CATEGORIES

A-244

RL-DD052

## Long-term Monitoring Around And Under The 221-U Facility For CDI

Technologies Are Needed To Monitor Contaminants In The Soil Around And Under The 221-u Facility To Verify That Contaminants Are Being Contained Now And In The Future.

### SCREENING CATEGORIES

A-245

RL-SS24-S

## Detection/distribution Of Contaminants - Chemical Binding On Site-specific Mineral Surfaces

## Research Is Needed To Characterize The Chemical Composition Of Microbially-produced, Metal-binding Molecules.

## SCREENING CATEGORIES

A-246

RL-SS25-S

## Detection/distribution Of Contaminants - Chemical Form And Mobility Of Dense, Non-aqueous Phase Liquids In Hanford Subsurface

Better Understanding Of Chemical Form And Mobility Of Dense, Non-aqueous Phase Liquids (DNAPL's) Below Ground.

### **SCREENING CATEGORIES**

<b><u>SCREENING QUESTIONS</u></b>					
Pertains to site maintenance	<input type="checkbox"/>				
Relates to final engineered system performance	<input type="checkbox"/>				
Improves data management	<input type="checkbox"/>				
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting
Involves long term monitoring and surveillance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility
Pertains to non S and T	<input type="checkbox"/>				
Better confidence in risk prediction	<input checked="" type="checkbox"/>				
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>				
		Cross Cutting			
		Long Term Monitoring Risk Water Soil Engineered Units Facility			

RL-SS26-s

## Transport Of Contaminants - Reaction Rates For Key Contaminant Species And Complexes In Site-specific Groundwater

Determine How And How Fast Contaminants Change Chemical Form And/or Interacts With Minerals (e.g. Carbonates) In Soil.

### SCREENING CATEGORIES

A-248



## NEED CODE:

RL-SS27

## NEED TITLE:

Use Of Field Data From Representative Sites To Elucidate Controlling Features And Processes For Contaminant Distribution

## PLAIN LANGUAGE:

Need To Investigate Field Sites To Develop A Better Understanding Of Physical And Chemical Processes That Affect Contaminant Distribution Thereby Increasing Confidence In Predicting Contaminant Travel Times.

### SCREENING CATEGORIES

#### SCREENING QUESTIONS

Pertains to site maintenance

☐

Relates to final engineered system performance

☐

Improves data management

☐

Contributes to better understanding of fate and transport

☒

Involves long term monitoring and surveillance

☐

Pertains to non S and T

☐

Better confidence in risk prediction

☒

Enhances ability to respond to failure in final configuration

☐

#### Waste Form/Physical Barriers

Durability  
Maintainability  
Monitoring  
Predictability  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐

#### Data Collection/Transmission

Sensor/Device  
Durability  
Maintainability  
Calibration  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐

#### Information Management

Data Analysis  
Data Interpretation  
Reporting  
Accessibility  
Retention  
Records Mgmt  
Cost of Records Mgmt  
Water  
Soil  
Engineered Units  
Facility

☐

#### Environmental Setting

Contaminant Modeling  
Fate & Transport  
Toxicity  
Ecological Indicators  
Uncertainty Analysis  
Subsurface Issues  
Model Validation  
System Performance Validation  
Water  
Soil  
Engineered Units  
Facility

☒

#### Cross Cutting

Long Term Monitoring  
Risk  
Water  
Soil  
Engineered Units  
Facility

☐

RL-SS27-s

# Transport Of Contaminants - Rate Of Coupled Abiotic And Biogeochemical Reactions Involving Contaminants In Hanford Subsurface

## A Better Understanding Of The Chemical And Biological Interactions That Affect Contaminant Movement Below Ground.

### **SCREENING CATEGORIES**

<b><u>SCREENING QUESTIONS</u></b>						
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div> <div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Data Collection/ Transmission</div> <div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Information Management</div> <div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Environmental Setting</div> <div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div> <div><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Cross Cutting</div> <div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

## NEED CODE:

RL-SS28

## NEED TITLE:

Understand, Quantify And Develop Descriptions Of Reactions And Interactions Between Contaminants Of Concern And Vadose Zone Sediments

## PLAIN LANGUAGE:

A Better Understanding Of Why Contaminants Become More Or Less Mobile With Longer Contact Times, And The Physical, Chemical, And Biological Causes Of Such Changes And How They Are Appropriately Modeled.

**SCREENING CATEGORIES****SCREENING QUESTIONS**

Pertains to site maintenance

☐

Relates to final engineered system performance

☐

Improves data management

☐

Contributes to better understanding of fate and transport

☒

Involves long term monitoring and surveillance

☐

Pertains to non S and T

☐

Better confidence in risk prediction

☒

Enhances ability to respond to failure in final configuration

☐**Waste Form/Physical Barriers**

Durability  
Maintainability  
Monitoring  
Predictability  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Data Collection/Transmission**

Sensor/Device  
Durability  
Maintainability  
Calibration  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Information Management**

Data Analysis  
Data Interpretation  
Reporting  
Accessibility  
Retention  
Records Mgmt  
Cost of Records Mgmt  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Environmental Setting**

Contaminant Modeling  
Fate & Transport  
Toxicity  
Ecological Indicators  
Uncertainty Analysis  
Subsurface Issues  
Model Validation  
System Performance Validation  
Water  
Soil  
Engineered Units  
Facility

☒☒☐☐☒☐☒☐☐☐☐☐☐☐☐☐**Cross Cutting**

Long Term Monitoring  
Risk  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

RL-SS28-s

## Transport Of Contaminants - Rates Of Colloid Formation And Colloidal Transport Of Contaminants In Site-specific Groundwater

Need To Determine The Mechanisms And Rates Of Production Of Inorganic And Organic Colloids In Groundwater, The Rates Of Adsorption Of Contaminants Onto Colloids, And The Effect Of Colloid-facilitated Transport On Contaminant Migration.

### **SCREENING CATEGORIES**

<b><u>SCREENING QUESTIONS</u></b>					
Pertains to site maintenance	<input type="checkbox"/>				
Relates to final engineered system performance	<input type="checkbox"/>				
Improves data management	<input type="checkbox"/>				
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>	Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting
Involves long term monitoring and surveillance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility
Pertains to non S and T	<input type="checkbox"/>				
Better confidence in risk prediction	<input checked="" type="checkbox"/>				
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>				
		Cross Cutting			
		Long Term Monitoring Risk Water Soil Engineered Units Facility			

RL-SS29

### Develop Descriptions Of Contaminant Flow And Transport In The Vadose Zone

Need To Improve The Modeling Of Below Ground Contaminant Movement By Including Additional Processes (e.g. The Coupling Of Physical And Chemical Processes), With Finer Grids And Time Spacings, For Better Simulation.

### SCREENING CATEGORIES

A-253

RL-SS29-s

## Transport Of Contaminants - Effect Of Subsurface Heterogeneities On Chemical Reaction And Transport

Need To Develop Detection Methods That Provide Adequate Signal Penetration And Reflection/refraction And Account For Sediment Moisture, Grain Size, And Clay Content. Science Is Needed To Determine Chemical Information In Situ As Well.

## SCREENING CATEGORIES

A-254

RL-SS30

Understand And Quantify Water Movement In The Vadose Zone Using Uncontaminated Field Sites.

Better Understanding Of The Nature And Extent Of Preferred Flow Paths Below Ground Along With A Determination Of Which Physical Features And Moisture Conditions Affect The Preferred Flow Paths Is Needed.

### SCREENING CATEGORIES

A-255

RL-SS30-s

## Transport Of Contaminants - Remedial Technology For Cesium Beneath Waste Tanks

A Need For An Improved Understanding Of The Chemical Processes Affecting Cesium Transport Below Ground In Conjunction With HLW Tank Liquids.

### SCREENING CATEGORIES

A-256



RL-SS31-s

Remediation - Mathematical Formulations Of Chemical Reaction/material Transport

## A Need For Better Computational Tools To Address A Wide Range Of Chemical Reactions, And Reaction Rates.

### **SCREENING CATEGORIES**

A-257

RL-SS32

Understand And Quantify The Relationship Between Contaminant Sources, Vadose Zone Plume Properties And Groundwater Plume Properties At Hydrologic Boundaries With A Focus On The Groundwater-vadose

Better Understand The Behavior Of Contaminants At The Water Table Boundary.

## SCREENING CATEGORIES

A-258

**NEED CODE:** RL-SS32-s

**NEED TITLE:** Remediation - Reactivity Of Organics In The Hanford Subsurface

**PLAIN LANGUAGE:** Better Understanding Of The Biodegradation Of Halogenated Organic Compounds And Metal/radionuclide Organic Constituents.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>				X X          X X    X	

**NEED CODE:**

RL-SS33

**NEED TITLE:**

Techniques To Delineate Groundwater Plumes In Three Dimensions And Define A Scientific Basis For Addressing Scaling Issues In Hanford Groundwater

**PLAIN LANGUAGE:**

Better Understand How To Incorporate Three-dimensional Properties Of Contaminated Groundwater And Regional-scale Data Into Predictions Of Contaminant Concentration And Distribution.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

RL-SS33-s

NEED TITLE:

Remediation - Interaction Of Remedial Processes With Hanford Subsurface

PLAIN LANGUAGE:

Need To Measure Reaction Rates Of Contaminants Being Remediated And Those Solids, Liquids, And/or Gases Introduced As Part Of Remedial Action.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

## NEED CODE:

RL-SS34

## NEED TITLE:

Understand, Quantify And Develop Descriptions Of Biogeochemical Reactions And Interactions Between Contaminants Of Concern And Aquifer Sediments To Describe Biochemical Reactive Transport

## PLAIN LANGUAGE:

A Better Understanding Is Needed Of The Chemical, Physical, And Biological Processes That Affect The Long-term Behavior Of Contaminants As They Enter The Aquifer And During Transport To The River.

**SCREENING CATEGORIES****SCREENING QUESTIONS**

Pertains to site maintenance

☐

Relates to final engineered system performance

☐

Improves data management

☐

Contributes to better understanding of fate and transport

☒

Involves long term monitoring and surveillance

☐

Pertains to non S and T

☐

Better confidence in risk prediction

☒

Enhances ability to respond to failure in final configuration

☐**Waste Form/Physical Barriers**

Durability  
Maintainability  
Monitoring  
Predictability  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Data Collection/Transmission**

Sensor/Device  
Durability  
Maintainability  
Calibration  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Information Management**

Data Analysis  
Data Interpretation  
Reporting  
Accessibility  
Retention  
Records Mgmt  
Cost of Records Mgmt  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Environmental Setting**

Contaminant Modeling  
Fate & Transport  
Toxicity  
Ecological Indicators  
Uncertainty Analysis  
Subsurface Issues  
Model Validation  
System Performance Validation  
Water  
Soil  
Engineered Units  
Facility

☒☒☐☐☒☒☒☐☐☐☐☐☐☐☐☐**Cross Cutting**

Long Term Monitoring  
Risk  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

RL-SS35

## Technologies To Quantify The Flux Of Contaminant From Hanford Groundwater To The Columbia River

Better Understanding Of How Contaminants Move To The River (shoreline, Bed Of The River, And How Far Out Into The River), And How Discharges Are Affected By Daily And Seasonal Variations Of The River Flows.

## SCREENING CATEGORIES

SCREENING QUESTIONS									
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div> <div>           Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility         </div>	<div>Data Collection/Transmission</div> <div>           Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility         </div>	<div>Information Management</div> <div>           Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility         </div>	<div>Environmental Setting</div> <div>           Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility         </div>	<div>Cross Cutting</div> <div>           Long Term Monitoring Risk Water Soil Engineered Units Facility         </div>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Relates to final engineered system performance	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	
Improves data management	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	
Involves long term monitoring and surveillance	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	
Pertains to non S and T	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Better confidence in risk prediction	<input checked="" type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NEED CODE:

RL-SS35-S

NEED TITLE:

Monitoring Of Contaminants - Use Of Chemical Surrogates For Contaminants

PLAIN LANGUAGE:

Need To Identify An Easy-to-measure Substitute Chemical As An Estimator For A Hard-to-measure Contaminant.

		<b>SCREENING CATEGORIES</b>				
<b>SCREENING QUESTIONS</b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					



**NEED CODE:**

RL-SS36

**NEED TITLE:**

Provide Means To Integrate Regional-scale Phenomena Into Assessments Of Contaminant Transport And Impacts Within The Columbia River.

**PLAIN LANGUAGE:**

A Need To Model And Understand Regional Effects Of Chemical And Physical Components On Contaminant Movement To River Systems.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

RL-SS37

Provide Methodology To Relate Information Derived From Sitewide-scale Groundwater Flow Modeling To The Various Scales Associated With Assessing Impacts In The River Environment

## A Need To Develop Transport Models To Quantify The Changes In Groundwater Characteristics, Flow Path, And Mathematical Computations For Estimating Contaminant Concentrations In The River.

## SCREENING CATEGORIES

<b><u>SCREENING QUESTIONS</u></b>							
Pertains to site maintenance	<input type="checkbox"/>	<div style="border: 1px solid black; padding: 5px;">Waste Form/Physical Barriers</div> Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water  Soil Engineered Units Facility	<div style="border: 1px solid black; padding: 5px;">Data Collection/ Transmission</div> Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water  Soil Engineered Units Facility	<div style="border: 1px solid black; padding: 5px;">Information Management</div> Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water  Soil Engineered Units Facility	<div style="border: 1px solid black; padding: 5px;">Environmental Setting</div> Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water  Soil Engineered Units Facility	<div style="border: 1px solid black; padding: 5px;">Cross Cutting</div> Long Term Monitoring Risk Water Soil Engineered Units Facility	
Relates to final engineered system performance	<input checked="" type="checkbox"/>						
Improves data management	<input type="checkbox"/>						
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>						
Involves long term monitoring and surveillance	<input type="checkbox"/>						
Pertains to non S and T	<input type="checkbox"/>						
Better confidence in risk prediction	<input checked="" type="checkbox"/>						
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>						

NEED CODE:

RL-SS37-S

NEED TITLE:

Monitoring Of Contaminants - Chemical Sensor Principles

PLAIN LANGUAGE:

A Better Understanding Of The Physics And Chemistry That Will Lead To More Accurate And More Sensitive Measurements Of Contaminant Concentrations.

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

RL-SS38

Understand, Quantify And Develop Descriptions Of Transport And Transformation Of Groundwater-derived Contaminants Of Concern In The River

Develop A System (techniques/equipment/instrumentation) To Measure Chemical, Physical, And Biological Parameters In The Area Between The Aquifer And The River, And To Validate And Verify Models.

## SCREENING CATEGORIES

A-268

NEED CODE:

RL-SS39

NEED TITLE:

Understand And Provide Means To Quantify The Impacts Of River Contamination On Receptors

PLAIN LANGUAGE:

Need To Develop Consistent Ways To Measure Impacts (human, Ecological, Cultural, Socioeconomic) To Exposed Groups.  
Information Will Be Used To Determine Toxicity Benchmarks For  
The Receptors and the Process

		<b><u>SCREENING CATEGORIES</u></b>				
<b><u>SCREENING QUESTIONS</u></b>		<b>Waste Form/Physical Barriers</b>	<b>Data Collection/ Transmission</b>	<b>Information Management</b>	<b>Environmental Setting</b>	<b>Cross Cutting</b>
Pertains to site maintenance	<input type="checkbox"/>					
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE:

RL-SS40

NEED TITLE:

Provide A Method To Develop Mass Balance (i.e., Holistic) Inventory Estimates

PLAIN LANGUAGE:

There Is A Need For A Single And Consistent Inventory Of The Discharges And Disposals Of Radionuclides And Chemicals To The Surface And Subsurface.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	Waste Form/Physical Barriers			Data Collection/ Transmission			Information Management			Environmental Setting			Cross Cutting	
Relates to final engineered system performance	<input checked="" type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>									
Improves data management	<input checked="" type="checkbox"/>														
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input checked="" type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														
							<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>	<div></div> <div></div> <div><input checked="" type="checkbox"/></div> <div><input checked="" type="checkbox"/></div> <div><input checked="" type="checkbox"/></div> <div></div> <div><input checked="" type="checkbox"/></div> <div><input checked="" type="checkbox"/></div> <div></div> <div></div>	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>				

## NEED CODE:

RL-SS41

## NEED TITLE:

Understand And Quantify The Solubility Of Contaminants Of Concern At The Waste-Vadose Zone Sediment Interface

## PLAIN LANGUAGE:

A Better Understanding Of Solubility Of Certain Contaminants In Various Waste Matrices (e.g., Tc In Tank Waste) And How This Solubility Changes As The Waste Interacts With The Below Ground Sediments.

---

**SCREENING CATEGORIES**
**SCREENING QUESTIONS**

Pertains to site maintenance

☐

Relates to final engineered system performance

☐

Improves data management

☐

Contributes to better understanding of fate and transport

☒

Involves long term monitoring and surveillance

☐

Pertains to non S and T

☐

Better confidence in risk prediction

☒

Enhances ability to respond to failure in final configuration

☐
**Waste Form/Physical Barriers**

Durability  
Maintainability  
Monitoring  
Predictability  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
**Data Collection/Transmission**

Sensor/Device  
Durability  
Maintainability  
Calibration  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
**Information Management**

Data Analysis  
Data Interpretation  
Reporting  
Accessibility  
Retention  
Records Mgmt  
Cost of Records Mgmt  
Water  
Soil  
Engineered Units  
Facility

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
**Environmental Setting**

Contaminant Modeling  
Fate & Transport  
Toxicity  
Ecological Indicators  
Uncertainty Analysis  
Subsurface Issues  
Model Validation  
System Performance Validation  
Water  
Soil  
Engineered Units  
Facility

☒ ☒ ☐ ☐ ☒ ☐ ☐ ☒ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
**Cross Cutting**

Long Term Monitoring  
Risk  
Water  
Soil  
Engineered Units  
Facility

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

RL-WT017

## Long-term Testing Of Surface Barrier

There Is A Need For Better Understanding Of Long-term Performance Of Surface Barriers To Reduce Moisture Infiltration And Plant And Animal Intrusion.

### SCREENING CATEGORIES

A-272



RL-WT029

## Data And Tools For Performance Assessments

A Need For Better Estimates Of Water Movement Through Buried Waste Over Long Periods In Arid Environments To Reduce Uncertainty Of Models.

## **SCREENING CATEGORIES**

A-273

**NEED CODE:** RL-WT035-S

**NEED TITLE:** Moisture Flow And Contaminant Transport In Arid Conditions

**PLAIN LANGUAGE:** A Better Understanding Of The Soil Physics And Retardation Of Contaminants In Soils Under Natural Conditions Is Needed For Dose Calculations.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

RL-WT043-S

## Effect Of Human And Natural Influences On Long-term Water Distribution

A Need To Better Understand Long Term Land And Water Use At DOE Sites Considering Climate Change And The Ability To Incorporate Impacts Of Those Changes Into Models To Predict The Movement Of Contaminants.

## **SCREENING CATEGORIES**

A-275

RL-WT044-S

### Distribution Of Recharge Rates

A Need To Quantify Distribution Of Recharge Water Through The Waste Site And The Time Delay Through The Land Surface Into The Water Table.

### SCREENING CATEGORIES

A-276

NEED CODE: RL-WT045-S

NEED TITLE: Vadose Zone Flow Simulation Tool Under Arid Conditions

PLAIN LANGUAGE: Develop A Simulation Model To Predict The Movement Of Contaminants Over Long Periods Of Time In Arid Conditions.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability</div> <div>Maintainability</div> <div>Monitoring</div> <div>Predictability</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Sensor/Device</div> <div>Durability</div> <div>Maintainability</div> <div>Calibration</div> <div>Inspection Freq.</div> <div>Inspection Cost</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Data Analysis</div> <div>Data Interpretation</div> <div>Reporting</div> <div>Accessibility</div> <div>Retention</div> <div>Records Mgmt</div> <div>Cost of Records Mgmt</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Contaminant Modeling</div> <div>Fate &amp; Transport</div> <div>Toxicity</div> <div>Ecological Indicators</div> <div>Uncertainty Analysis</div> <div>Subsurface Issues</div> <div>Model Validation</div> <div>System Performance Validation</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>	<div>Long Term Monitoring</div> <div>Risk</div> <div>Water</div> <div>Soil</div> <div>Engineered Units</div> <div>Facility</div>
Relates to final engineered system performance	<input type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

**NEED CODE:**

SR00-1026

**NEED TITLE:**

Reduce The Conservatism And Technical Uncertainty Associated With The Use Of Literature Coefficients (Kd) To Describe Radionuclide Sorption To Sediments In Performance Assessment Modeling.

**PLAIN LANGUAGE:**

There Is A Need To Develop Alternative Concepts For Describing Contaminant Separation Beneath Radioactive Waste Disposal Facilities.

**SCREENING CATEGORIES****SCREENING QUESTIONS**

Pertains to site maintenance

☐

Relates to final engineered system performance

☐

Improves data management

☐

Contributes to better understanding of fate and transport

☒

Involves long term monitoring and surveillance

☐

Pertains to non S and T

☐

Better confidence in risk prediction

☒

Enhances ability to respond to failure in final configuration

☐**Waste Form/Physical Barriers**

Durability  
Maintainability  
Monitoring  
Predictability  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Data Collection/Transmission**

Sensor/Device  
Durability  
Maintainability  
Calibration  
Inspection Freq.  
Inspection Cost  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Information Management**

Data Analysis  
Data Interpretation  
Reporting  
Accessibility  
Retention  
Records Mgmt  
Cost of Records Mgmt  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐**Environmental Setting**

Contaminant Modeling  
Fate & Transport  
Toxicity  
Ecological Indicators  
Uncertainty Analysis  
Subsurface Issues  
Model Validation  
System Performance Validation  
Water  
Soil  
Engineered Units  
Facility

☒☒☐☐☐☒☒☒☒☒☐☐☐☐☐☐☐☐☐☐☐**Cross Cutting**

Long Term Monitoring  
Risk  
Water  
Soil  
Engineered Units  
Facility

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

NEED CODE: SR00-1030

NEED TITLE: Model Degradation In Cement Based Wasteform (e.g., Saltstone) And Concrete Vault Degradation And Collapse

PLAIN LANGUAGE: There Is A Need To Develop A Model To Simulate The Degradation Of Saltstone, A Cement-based Wasteform, And The Concrete Vaults Into Which It Is Emplaced Over Time Periods Of Thousands Of Years.

		SCREENING CATEGORIES				
SCREENING QUESTIONS		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div>X<input type="checkbox"/><input type="checkbox"/>X<input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/>X<input type="checkbox"/></div>	<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div> <div>X<input type="checkbox"/>X<input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/>X<input type="checkbox"/></div>	<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input checked="" type="checkbox"/>					
Involves long term monitoring and surveillance	<input type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					

NEED CODE: SR00-3027

NEED TITLE: Long Term Monitoring Technologies

PLAIN LANGUAGE: Need To Develop Insitu Remote Monitoring Technologies To Reduce The Cost Of Data Collection Associated With Waste Sites.

		<u>SCREENING CATEGORIES</u>				
<u>SCREENING QUESTIONS</u>		Waste Form/Physical Barriers	Data Collection/ Transmission	Information Management	Environmental Setting	Cross Cutting
Pertains to site maintenance	<input type="checkbox"/>	Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility	Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility	Contaminant Modeling Fate & Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility	Long Term Monitoring Risk Water Soil Engineered Units Facility
Relates to final engineered system performance	<input checked="" type="checkbox"/>					
Improves data management	<input type="checkbox"/>					
Contributes to better understanding of fate and transport	<input type="checkbox"/>					
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>					
Pertains to non S and T	<input type="checkbox"/>					
Better confidence in risk prediction	<input checked="" type="checkbox"/>					
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>					
		<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>



NEED CODE: SR00-4010

NEED TITLE: Characterization Data Management

PLAIN LANGUAGE: Need To Develop A Relational Database To Allow Storage And Retrieval Of Comprehensive Data, Including Photos And Videos Related A D&D Project.

<u>SCREENING QUESTIONS</u>		<u>SCREENING CATEGORIES</u>													
Pertains to site maintenance	<input type="checkbox"/>	<div>Waste Form/Physical Barriers</div>			<div>Data Collection/ Transmission</div>			<div>Information Management</div>			<div>Environmental Setting</div>			<div>Cross Cutting</div>	
Relates to final engineered system performance	<input type="checkbox"/>	<div>Durability Maintainability Monitoring Predictability Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div>Sensor/Device Durability Maintainability Calibration Inspection Freq. Inspection Cost Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div>Data Analysis Data Interpretation Reporting Accessibility Retention Records Mgmt Cost of Records Mgmt Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input checked="" type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div>Contaminant Modeling Fate &amp; Transport Toxicity Ecological Indicators Uncertainty Analysis Subsurface Issues Model Validation System Performance Validation Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>			<div>Long Term Monitoring Risk Water Soil Engineered Units Facility</div> <div><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/></div>	
Improves data management	<input checked="" type="checkbox"/>														
Contributes to better understanding of fate and transport	<input type="checkbox"/>														
Involves long term monitoring and surveillance	<input checked="" type="checkbox"/>														
Pertains to non S and T	<input type="checkbox"/>														
Better confidence in risk prediction	<input type="checkbox"/>														
Enhances ability to respond to failure in final configuration	<input type="checkbox"/>														